Mount Sinai Hospital
Sinai Health System
Joseph & Wolf Lebovic Health Complex

Mount Sinai Hospital

2019 Energy Conservation & Demand Management Plan

Sinai Health System

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1. Executive summary

The Sinai Health System's Mount Sinai Hospital (MSH) located in downtown Toronto operates 24/7, performing world-class acute care, research and other healthcare functions. Associated annual costs for electricity, water, steam, chilled water and natural gas at the facility are approximately $5.5M.

As part of fulfilling Ontario Regulation 507/18 of the Electricity Act (1998), a detailed review of energy consumption at MSH has been performed, and an updated Energy Conservation Demand Management Plan (ECDMP) has been generated to cover the 5-year period of Jan-2019 to Dec-2023.

A number of potential energy conservation measures (ECMs) have been identified, along with a forecast of total energy savings resulting from implementation. The annual savings for these initiatives total over $350k and almost 7% of annual utility expenditure, as summarized below:

ID #	Energy Conservation Measure	Electricity Savings (kWh/year)	Demand Savings (kW)	Steam Savings (kWh/year)	Chilled Water Savings (kWh/year)	Total Cost Savings ($/year)	Estimated Project Cost($)	Estimated Capital Incentive ($)	Simple Payback Ex. Incentive (years)	Measure Life (years)	Savings as % of Site Cost
1)	Lighting LED Retrofits	657,000	75	-	-	$53,758	$234,375	$18,750	4.0	5	1.0%
2)	Lighting Controls Upgrade	547,500	-	-	-	$14,387	$175,000	$54,750	8.4	> 5	0.3%
3)	Air Handling Unit Setback	3,753,849	-	3,817,225	1,917,461	$287,757	$2,000,000	$750,770	4.3	> 5	5.2%
4)	Air Handling Unit Heat Reclaim	- 81,687	- 19	991,800	204,217	$25,982	$300,000	$0	11.5	> 5	0.5%
	Total	**4,876,662**	**56**	**4,809,025**	**$2,121,678**	**$381,883**	**$2,709,375**	**$824,270**	**7.1**		**6.9%**

Mount Sinai Hospital's central energy conservation goal is to reduce energy consumption, energy demand, operating costs and greenhouse gas emissions without impacting the high standard of patient care. Specific goals for MSH are electricity, steam and chilled water usage reduction through capital project implementation and improved employee awareness and training.

This report subsequently provides analysis of each of the major utilities, their usage and potential savings measures, along with a summary of the previous ECDMP and details of each project identified as part of the updated ECDMP.

2. Background

2.1 Total utility consumption and costs

The Sinai Health System's Mount Sinai Hospital (MSH) located in downtown Toronto operates 24/7, performing acute care, research and other healthcare functions including chronic disease management, specialized cancer care, and emergency medicine.

Total site utility usage, expenditure and associated GHG emissions for the period of January to December 2018 are provided in the table below:

Utility	Unit	Total Consumption	Total Cost (Ex. Tax)	Average Utility Unit Cost	GHGs Emitted (tCO2e)
Electricity	kWh	30,533,833	$ 3,316,665	$ 0.11	1,221
Water	m3	140,856	$ 541,278	$ 3.84	-
Steam	klb	110,632	$ 1,652,255	$ 14.93	8,326
Chilled Water	TH	5,185,564	$ 1,427,325	$ 0.28	19
Natural Gas	m3	37,726	$ 5,306	$ 0.14	71
		TOTALS	**$ 5,510,198**		**9,638**

Figure 1: Jan-18 to Dec-18 utility consumption summary

Trending for utility usage, cost and GHG emissions over this same time period is provided below:

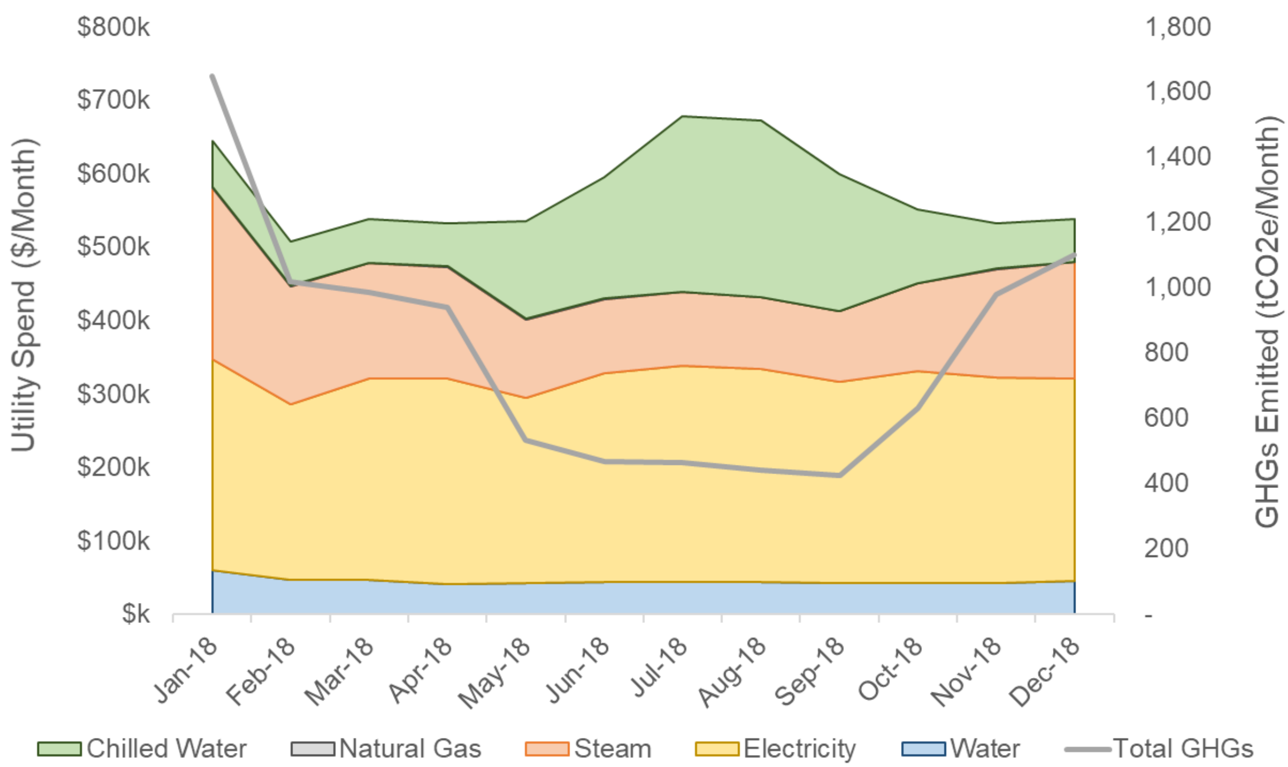

Figure 2: Utility spend and GHGs emissions trend, Jan-18 to Dec-18

2.2 Historical utility consumption

Utility consumption and costs from April 2015 to December 2018 are shown below for electricity, water, steam, chilled water and natural gas:

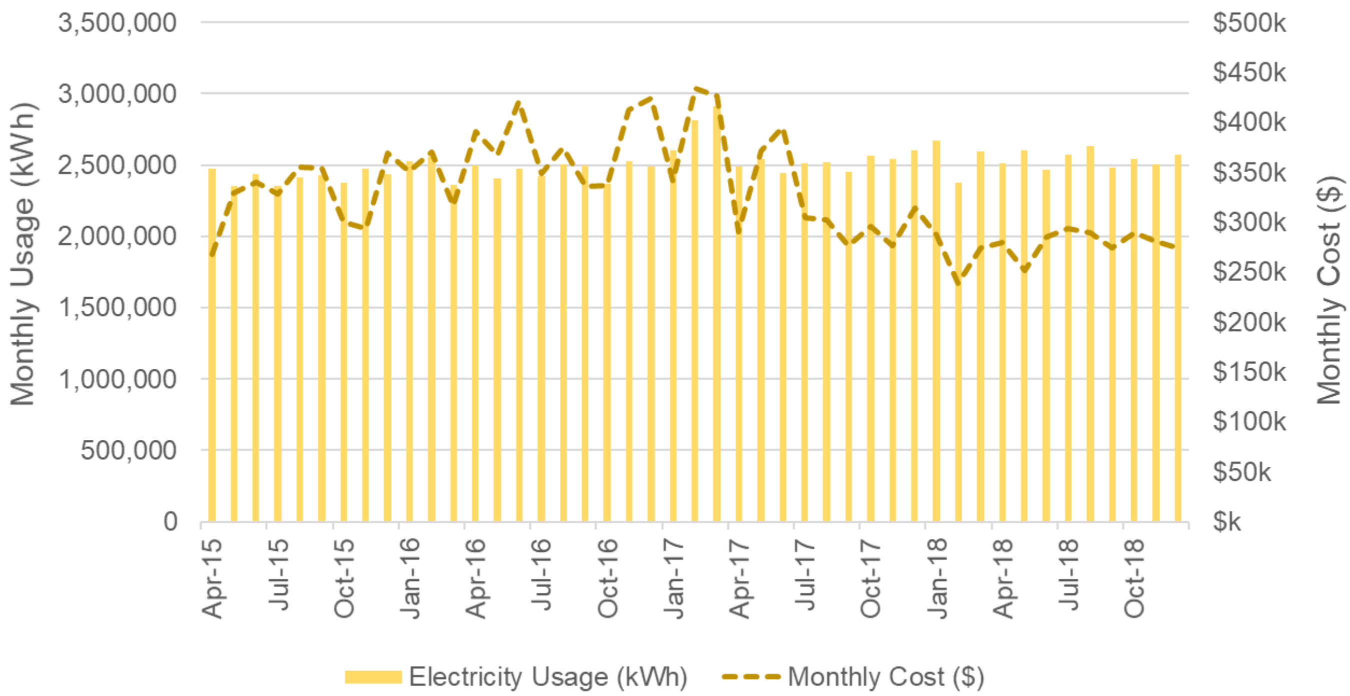

Figure 3: Historical electricity usage and cost

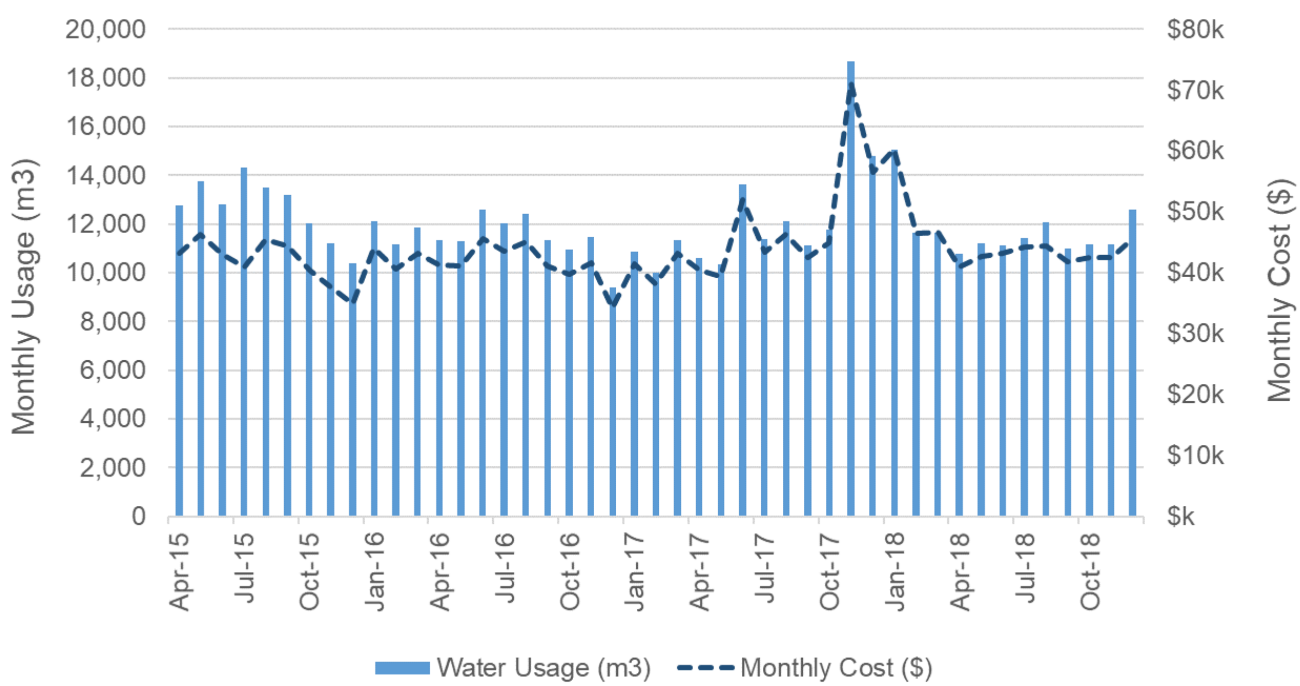

Figure 4: Historical water usage and cost

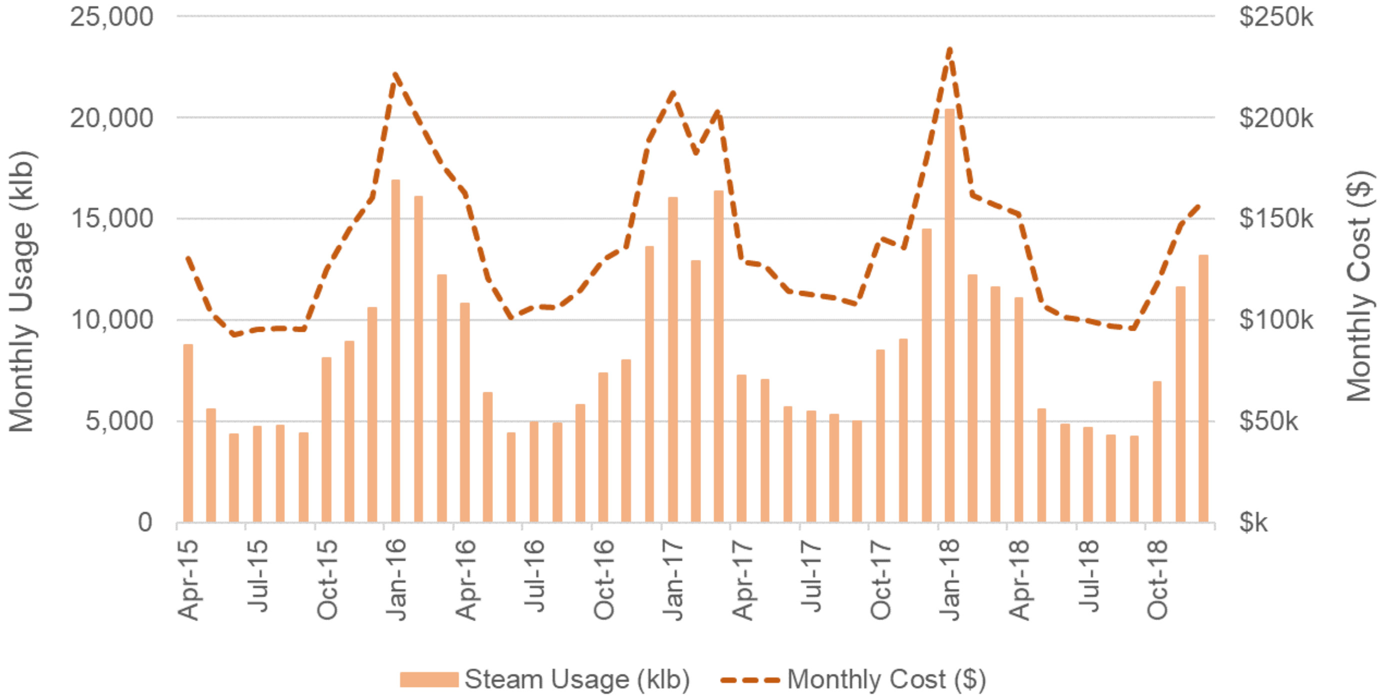

Figure 5: Historical steam usage and cost

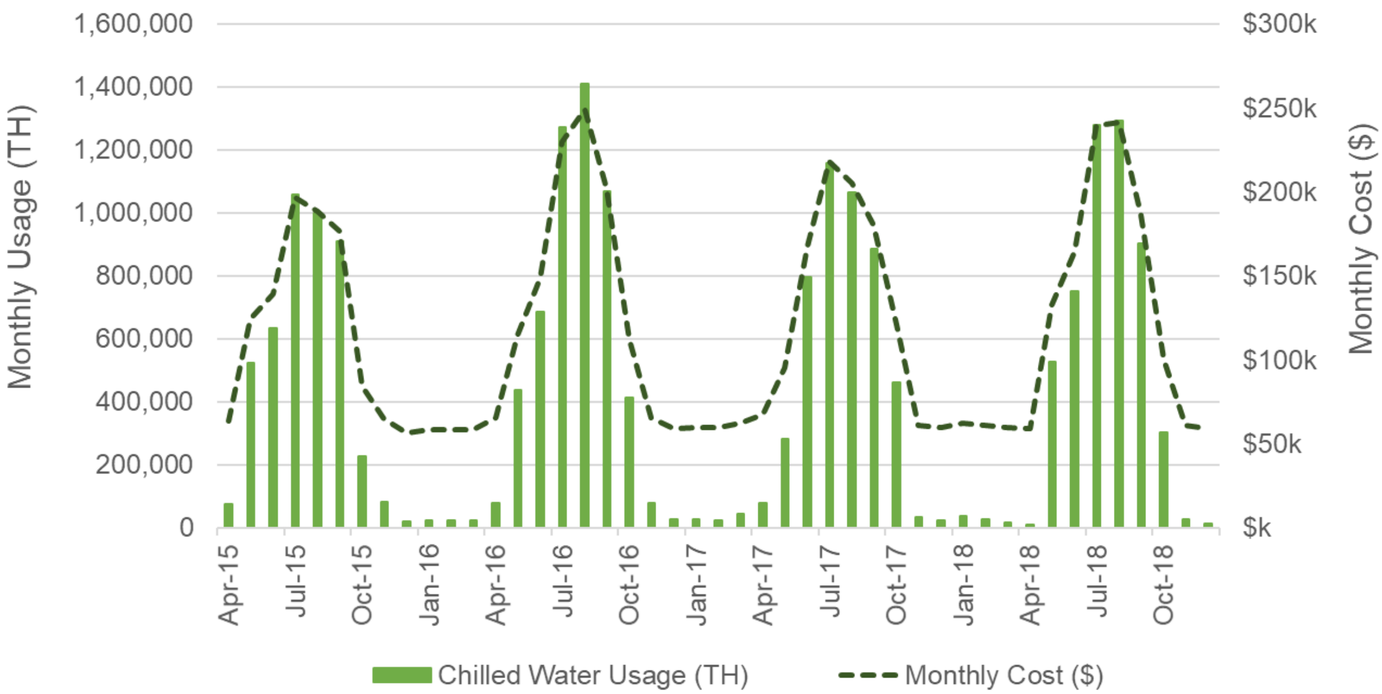

Figure 6: Historical chilled water usage and cost

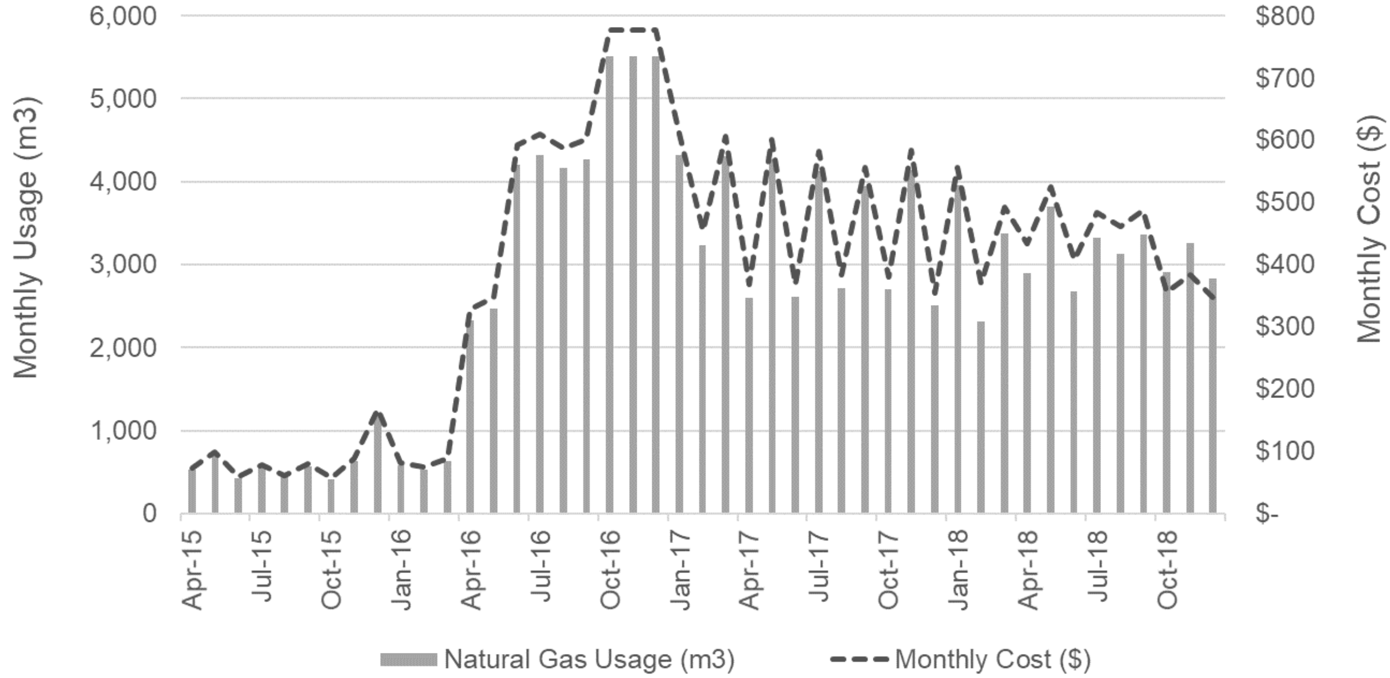

Figure 7: Historical natural gas usage and cost

Both steam and chilled water usage appear to vary cyclically and depend on outdoor air temperature, with steam usage increasing during colder months, and chilled water usage increasing during warmer months. This high level trend is expected given the site's significant space heating and cooling loads, which vary with outdoor air temperature as the site's heating and cooling systems maintain consistent internal room temperature and humidity setpoints.

Electricity and water consumption do not appear to vary cyclically at a monthly resolution, and there is likely some other driver responsible for variation in these values. It should be noted that the significant decrease in total electricity cost from mid-2017 onwards corresponds with the facility's switch from the Class B to Class A Global Adjustment rate tariff.

2.3 Additional energy sources

Mount Sinai Hospital does not currently operate any renewable energy generation systems. Ground source energy is used indirectly via chilled water supplied by the Enwave Energy Corporation's Deep Lake Water Cooling System (drawn from Lake Ontario), however this is not operated by MSH. No solar energy is currently harnessed at this time via systems operated by the public agency.

At present there are no plans to operate heat pump technology, thermal air technology or thermal water technology in the future outside of those noted in this report's proposed measures.

3. Utility consumption review

3.1 Electricity

3.1.1 Consumption and cost breakdown

Electricity consumption in 2018 was around 30.5 GWh at a cost of ~$3.3M before tax. Most of this cost (59%) was for Global Adjustment charges, as shown below:

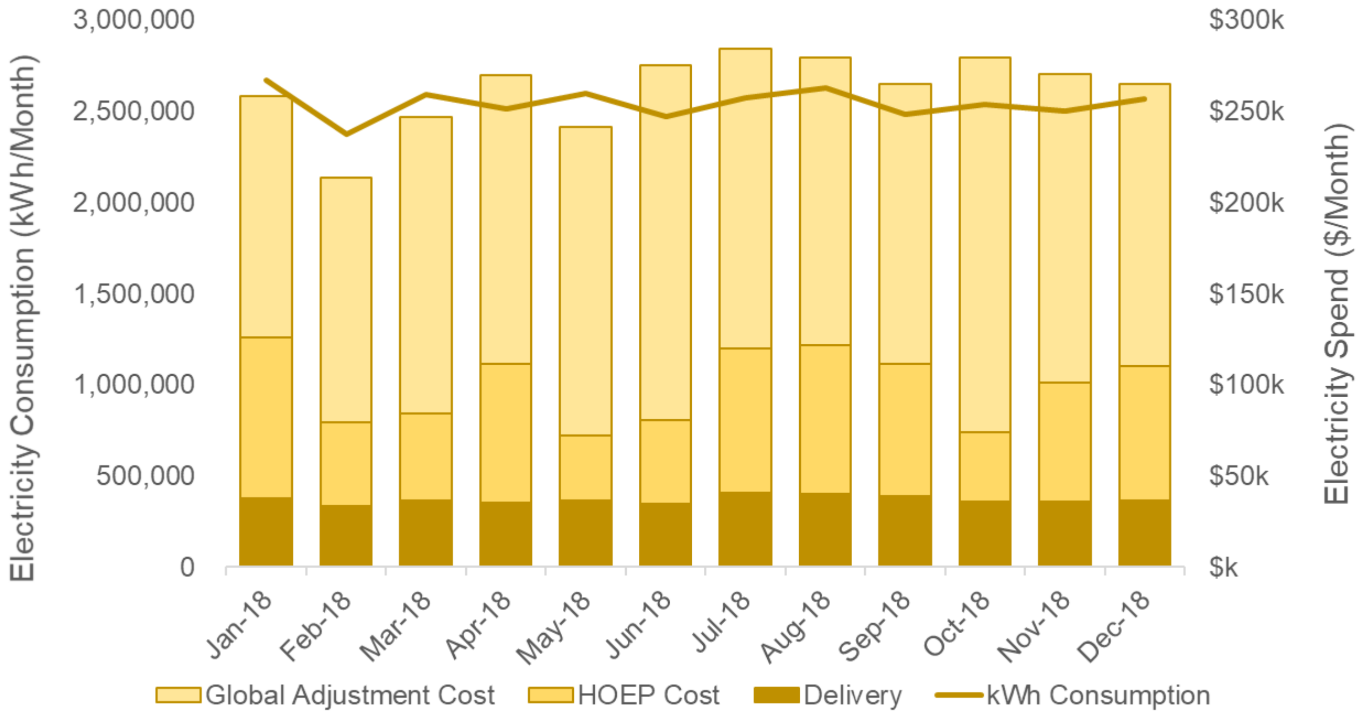

Figure 8: Electricity cost breakdown and consumption

Electricity for MSH is currently distributed by Toronto Hydro on the 1,000 kW to 4,999 kW rate tariff, with the commodity component purchased from ECNG. Electricity charges are broken out below:

Description	Cost ($)	Cost Basis
Commodity Cost	Spot	per kWh
Global Adjustment	Variable	Previous Year's PDF (Class A)
Transmission Network	$2.5677	per Peak kW per 30 days
Transmission Connection	$2.3030	per Max kW per 30 days
Customer Charge	$983.72	per 30 days
Distribution Volumetric Rate	$6.3766	per kVA per 30 days
Transformer Discount	-$0.62	per kVA per 30 days

Note: Data from Toronto Hydro 1,000 kW to 4,999 kW Tariff (May 1, 2019), Ex. Rate Riders

Table 1: Electricity cost breakdown, 1,000 kW to 4,999 kW rate tariff

3.1.2 Electricity use drivers

Multiple regression analyses were performed against available data such as tabulated patient days and hourly outdoor temperature to explain variation in electricity consumption at the facility. This analysis determined that the effect of both patient days (covering only Floors 10 to 14) and outdoor temperature on electricity consumption was negligible. Removing these variables and performing further regression analysis yielded the following equation:

Regression	Unit	Y-intercept	Coeff. #1	Coeff. #1 Value	R2
Electricity vs. F2-F9 Patient Days	kWh	855,522	BH Patient Days (F2-F9)	136.59	56.48%

Table 2 : Electricity regression results

Predicted electricity usage based on the above equation is plotted against actual site electricity consumption below for the period of April 2017 to December 2018:

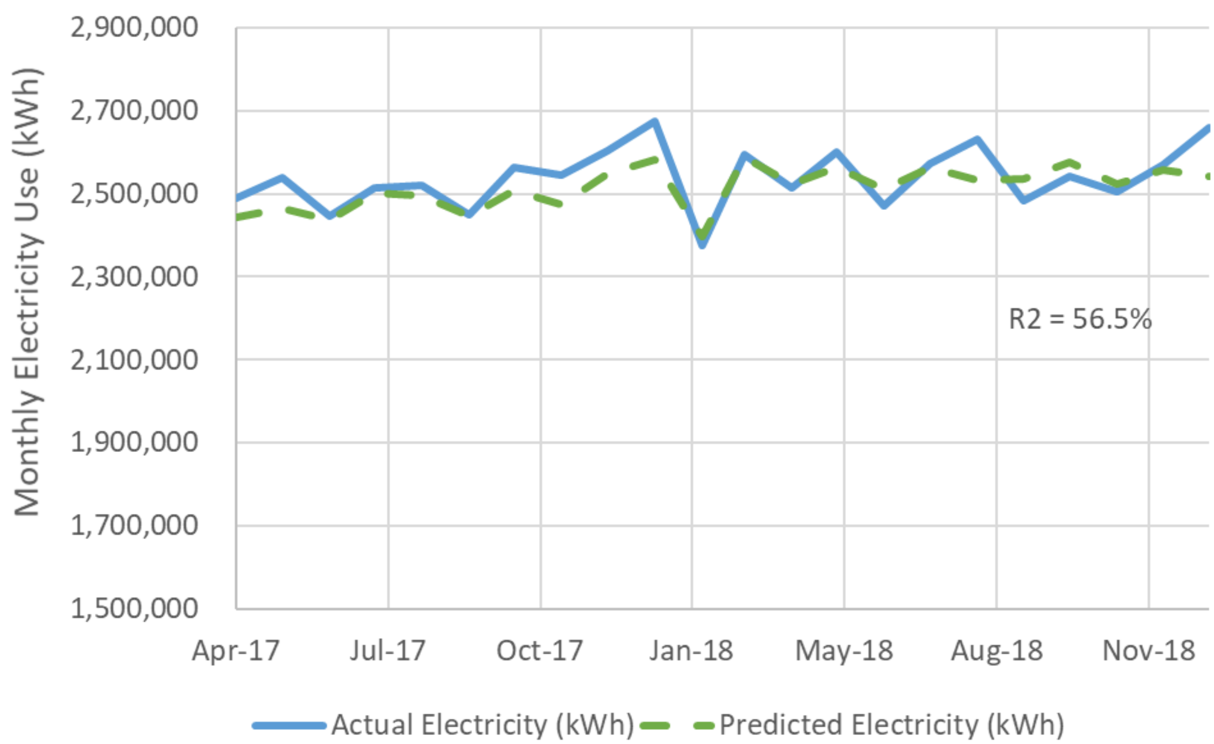

Figure 9 : Actual vs. predicted electricity consumption

The above coefficient of determination (R2) of 56.5% along with other statistical measures demonstrates that this model is not adequate to predict electricity consumption moving forward; further data and analysis is required to generate a sufficient baseline model for this facility.

3.1.3 End-use breakdown

Approximately 55% of total electricity at MSH is consumed in the supply, exhaust and return of air through the various distributed air handling units, with the remaining electricity split between lighting, general hospital loads, and other site systems. Electricity end-use consumptions have been calculated based on spot measurement data taken from the building's local Johnson Controls software, along with motor sizes and estimated loading/run hour data gathered during site visits.

The calculated electricity end-use breakdown for 2018 is provided below, broken out by asset class:

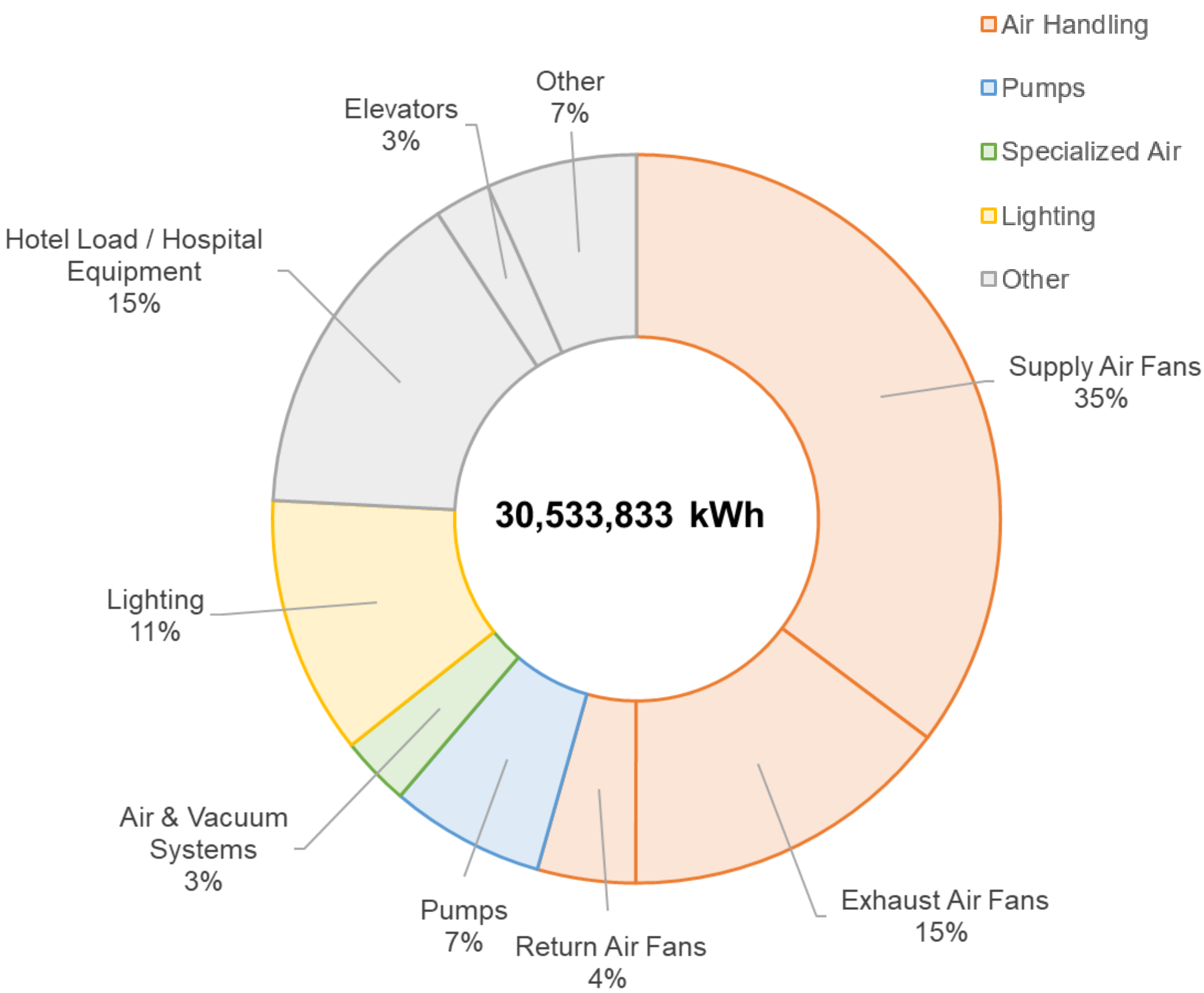

Figure 10 : Estimated 2018 electricity end-use breakdown

3.2 Steam

3.2.1 Consumption and cost breakdown

Steam consumption in 2018 was around 110,000 klbs at a cost of ~$1.6M before tax. Approximately 45% of this charge is made up by a static monthly "Capacity Charge", with the remainder varying based on steam consumption:

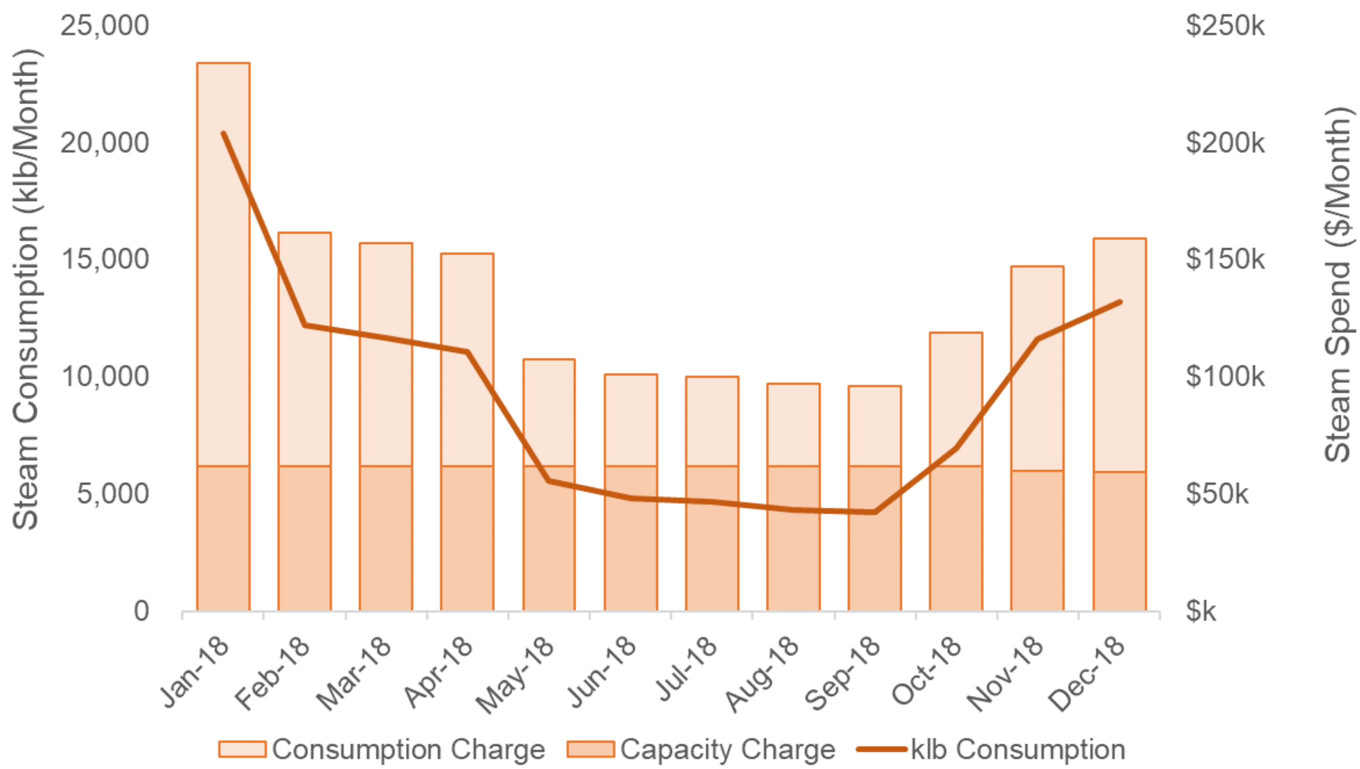

Figure 11: Steam cost breakdown and consumption

Steam for MSH is currently purchased through the Enwave Energy Corporation's District Heating System in Toronto. Charges for this utility are broken out below:

Description	Cost ($)	Cost Basis
Steam Consumption	$7.53	per Mlbs
Steam Capacity	$59,511.25	per Month

Note: Data from March 2019 Enwave bill

Table 3 : Steam cost breakdown

3.2.2 Steam use drivers

Regression analysis was performed against various available data sets to determine the drivers that explain monthly facility steam consumption. A good correlation (~89%) was determined from a multi-variate analysis, however the statistical effect of any patient-day drivers on steam consumption was negligible. Removing these as drivers and performing a single variable regression analysis with only monthly heating degree hours yielded the following equation:

Regression	Unit	Y-intercept	Coeff. #1	Coeff. #1 Value	R2
Steam vs. HDHs	klb	4,146	HDHs	0.6832	90.33%

Table 4 : Steam regression results

Predicted steam usage based on the above equation is plotted against actual site steam consumption for the period of April 2017 to December 2018:

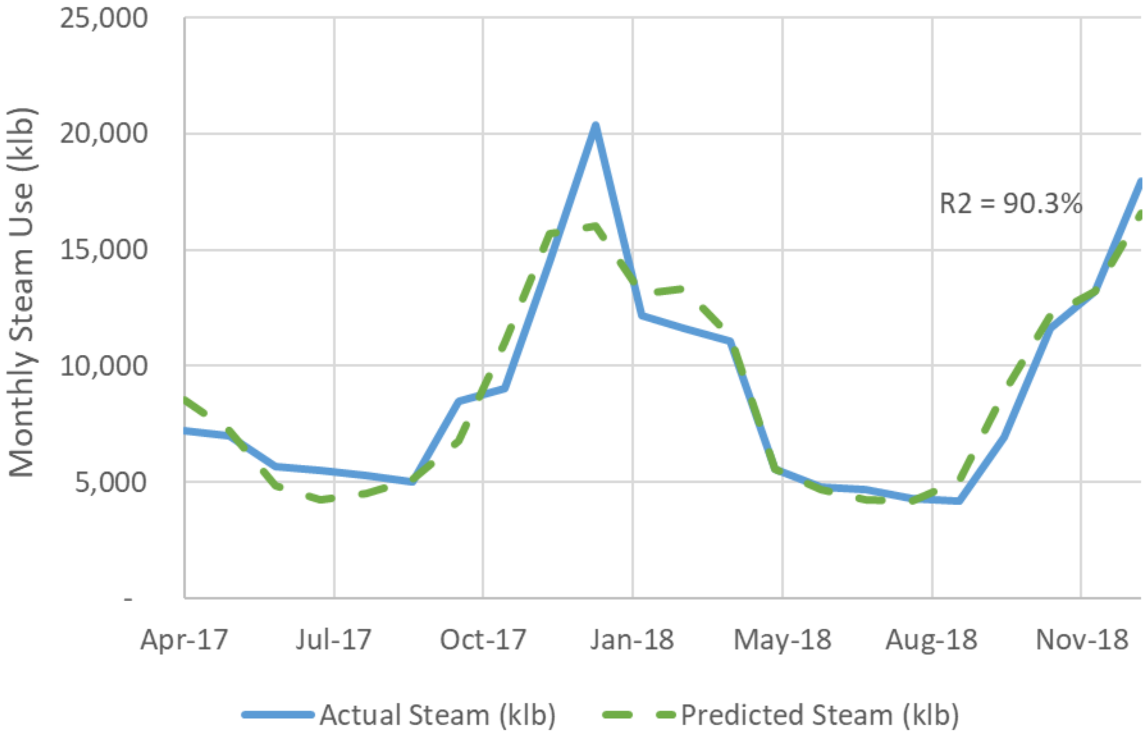

Figure 12 : Actual vs. predicted steam consumption

The high coefficient of determination (R2) of 90.3% along with other statistical measures demonstrates that this equation can be used to model baseline steam consumption moving forward and allow high-level savings quantification resulting from any steam-reduction initiatives.

3.2.3 End-use breakdown

Steam is primarily used at MSH for heating and humidifying incoming air, with the remainder used for domestic hot water heating and other heating loads which are performed year-round. A detailed hourly simulation has been generated for all known air handling units using air flow, relative humidity, return air % and temperature setpoint data gathered during site visits to estimate steam consumption.

The calculated steam end-use breakdown for 2018 is provided below with steam energy converted to kWh, broken out by general area served and asset class:

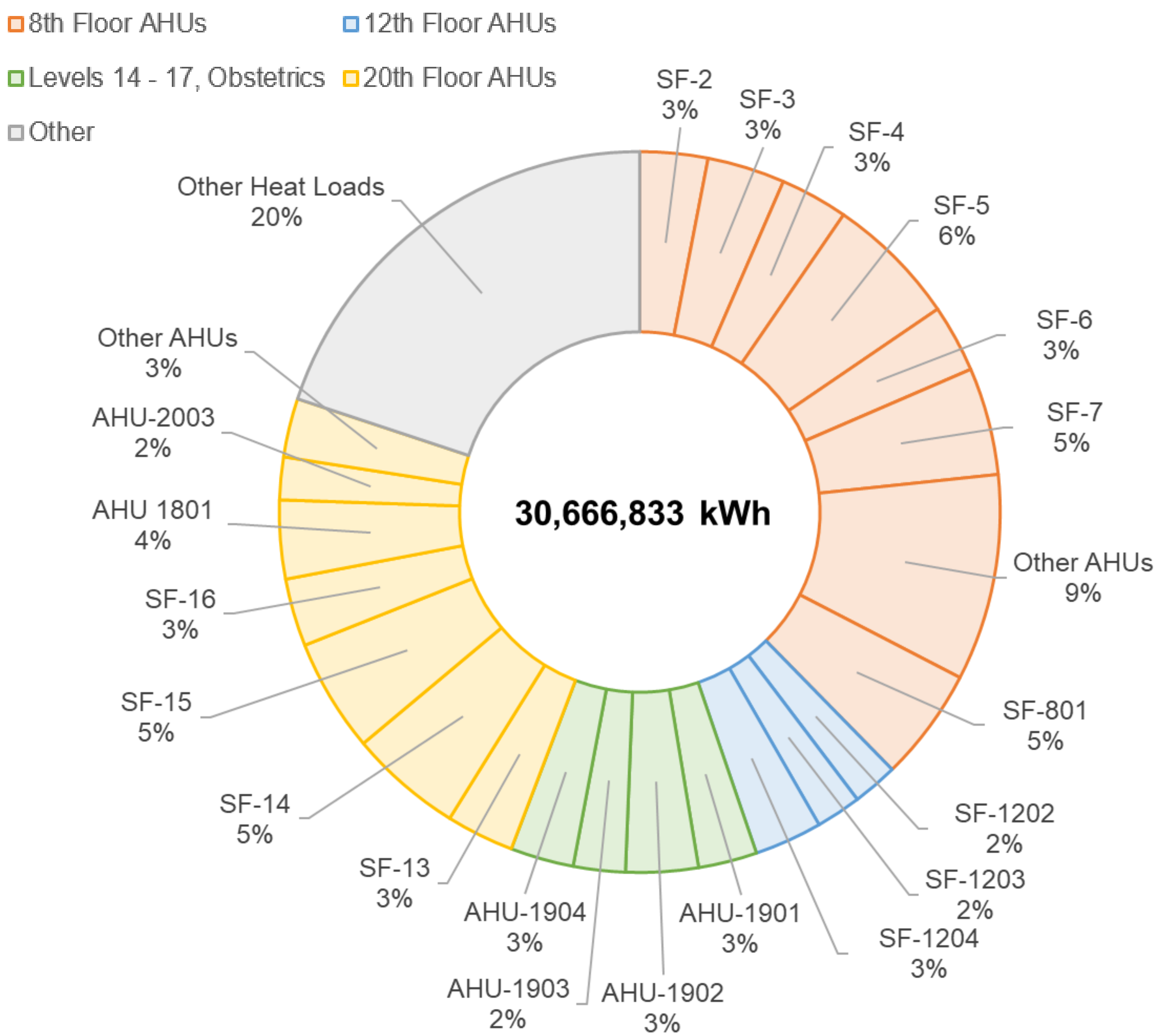

Figure 13 : Estimated 2018 steam end-use breakdown

3.3 Chilled water

3.3.1 Consumption and cost breakdown

MSH used approximately 5 Million Ton-hours of chilled water cooling in 2018 at a cost of ~$1.4M before tax. Approximately 50% of this charge is made up by a static monthly “Capacity Charge”, with the remainder varying based on actual chilled water consumption:

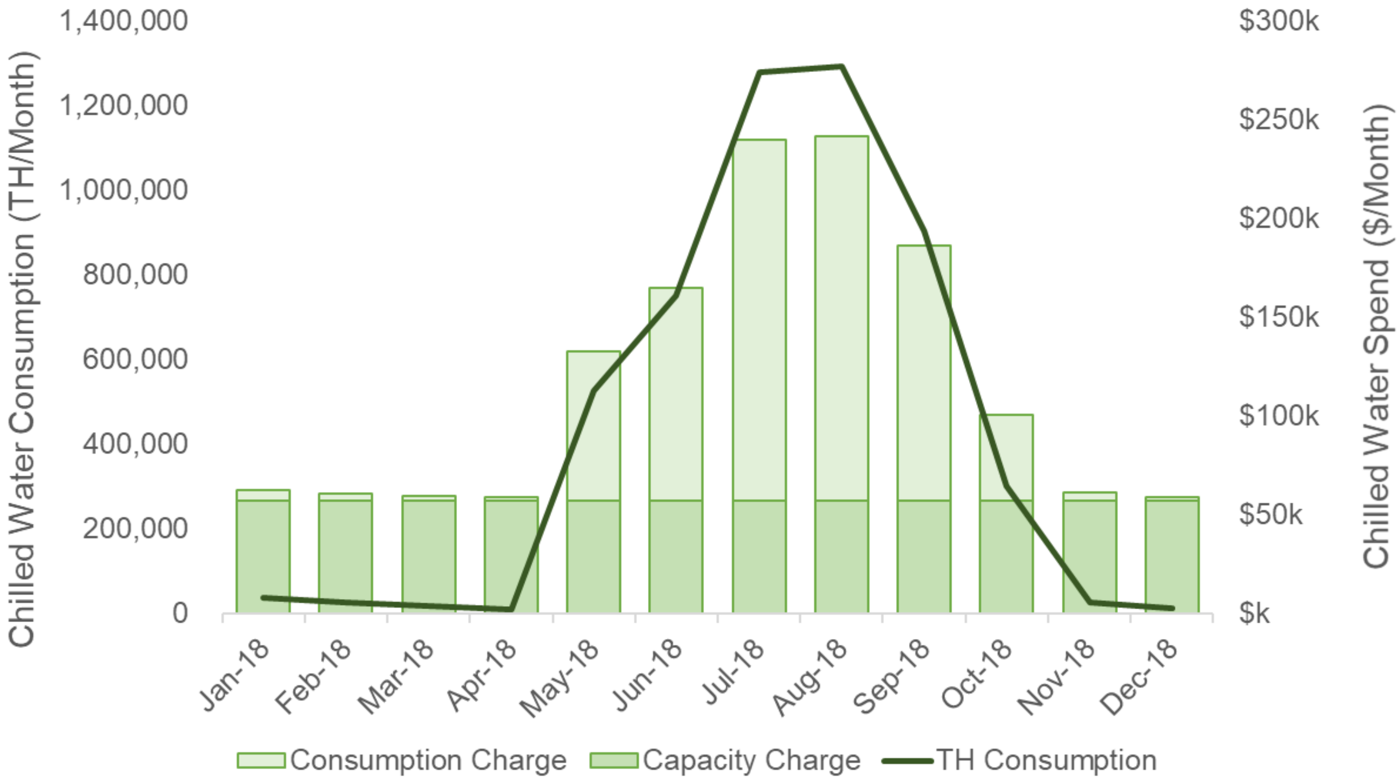

Figure 14 : Chilled water cost breakdown and consumption

Chilled water for MSH is currently purchased through the Enwave Energy Corporation’s Deep Lake Water Cooling System, which draws from Lake Ontario. Charges for this utility are broken out below:

Description	Cost ($)	Cost Basis
Chilled Water Consumption	$0.1458	per Ton-Hr
Chilled Water Capacity	$58,402.53	per Month

Note: Data from March 2019 Enwave bill

Table 5 : Chilled water cost breakdown

3.3.2 Chilled water drivers

Multiple regression analyses were performed against available data suspected to drive facility chilled water consumption. A good correlation (93%) was determined from this analysis, however the statistical effect of any patient-day drivers on chilled water consumption was negligible. These drivers were removed and further analysis was done to identify the ideal cooling degree day basis temperature for regression. Performing a single variable regression analysis with cooling degree hours at a 12 degree Celsius basis yielded the following equation:

Regression	Unit	Y-intercept	Coeff. #1	Coeff. #1 Value	R2
Chilled Water vs. CDHs	TH	23,972	CDHs (12 degC Basis)	145.01	97.79%

Table 6 : Chilled water regression results

Predicted chilled water usage based on the above equation is plotted against actual site chilled water consumption for the period of April 2017 to December 2018:

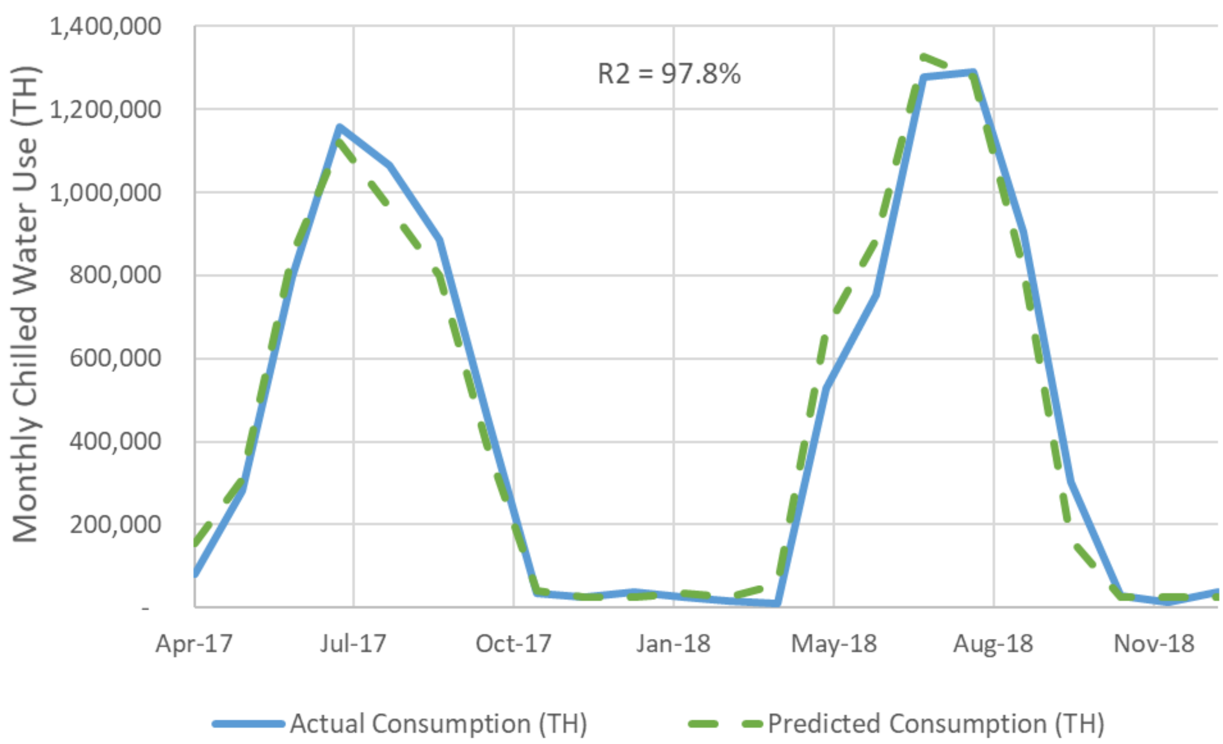

Figure 15 : Actual vs. predicted chilled water consumption

The high coefficient of determination (R2) of 97.8% along with other statistical measures demonstrates that this equation can be used to model baseline chilled water consumption moving forward and allow high-level savings quantification resulting from any chilled water-reduction projects.

3.3.3 End-use breakdown

Chilled water is primarily used at MSH for cooling incoming air, with the remainder used for hospital loads on the 2nd floor and other chilled water loads which are performed year-round. A detailed hourly simulation has been generated for all known air handling units using air flow, relative humidity, return air % and temperature setpoint data gathered during site visits to estimate chilled water consumption.

The calculated chilled water end-use breakdown for 2018 is provided below with chilled water energy converted to kWh, broken out by general area served and asset class:

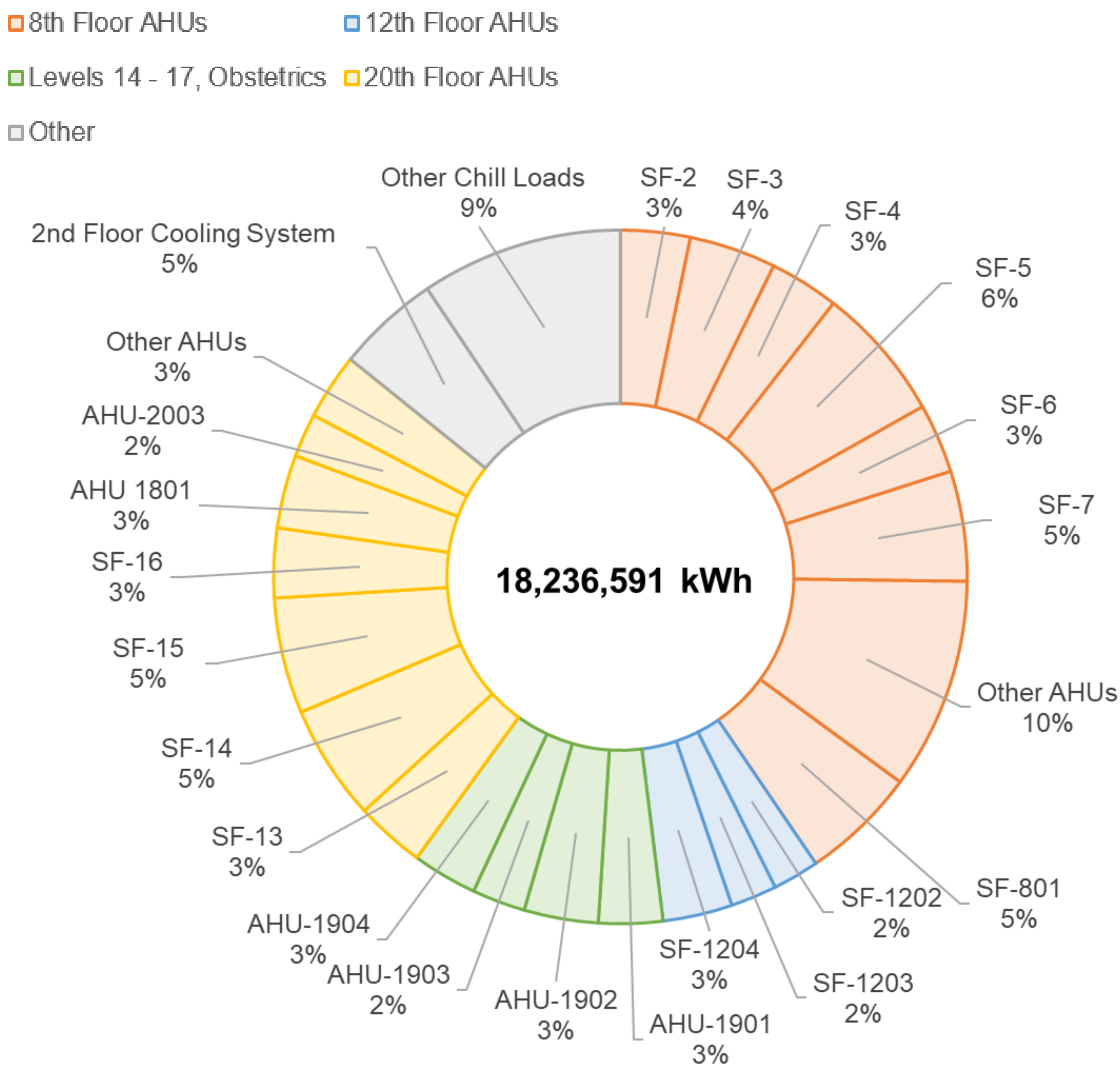

Figure 16 : Estimated 2018 chilled water end-use breakdown

3.4 Water

3.4.1 Consumption and cost breakdown

Water consumption in 2018 was around 140,000 m3 at a cost of ~$0.5M before tax. Water and sewer charges are combined into one overall line item, as shown below:

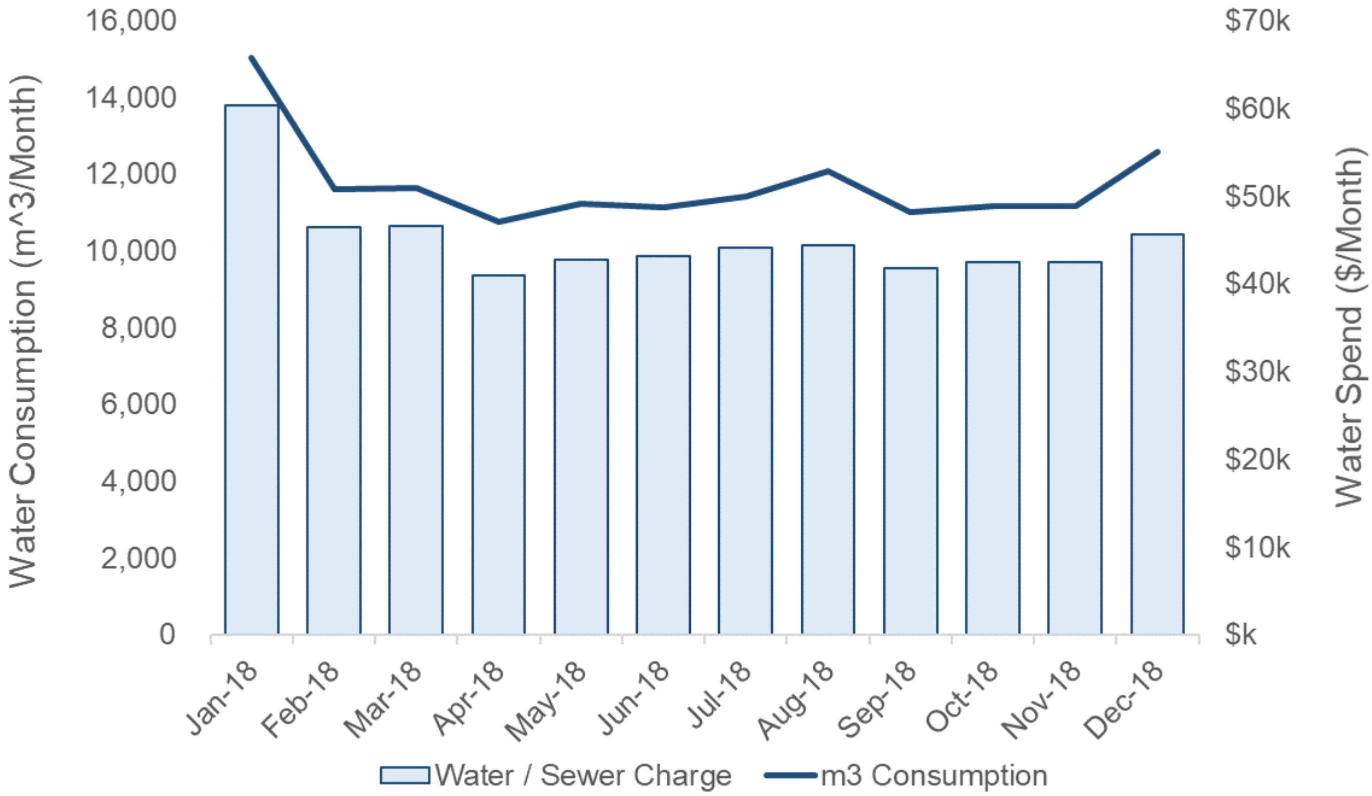

Figure 17 : Water cost breakdown and consumption

Water for MSH is currently provided by the City of Toronto; water charges are broken out below:

Description	Cost ($)	Cost Basis
Water / Sewer Services	$3.8036	per m3 (if paid before due date)
Water / Sewer Services	$4.0037	per m3 (if paid after due date)

Note: Data from March 2019 Toronto Water & Solid Waste Management Services Bill

Table 7 : Water cost breakdown

Due to the lack of existing submetering and high complexity of the water distribution network, further water driver analysis and end-use breakdown determination was not performed.

3.5 Natural gas

3.5.1 Consumption and cost breakdown

Natural gas consumption in 2018 was around 37,000 m3 at a cost of ~$5.3k before tax:

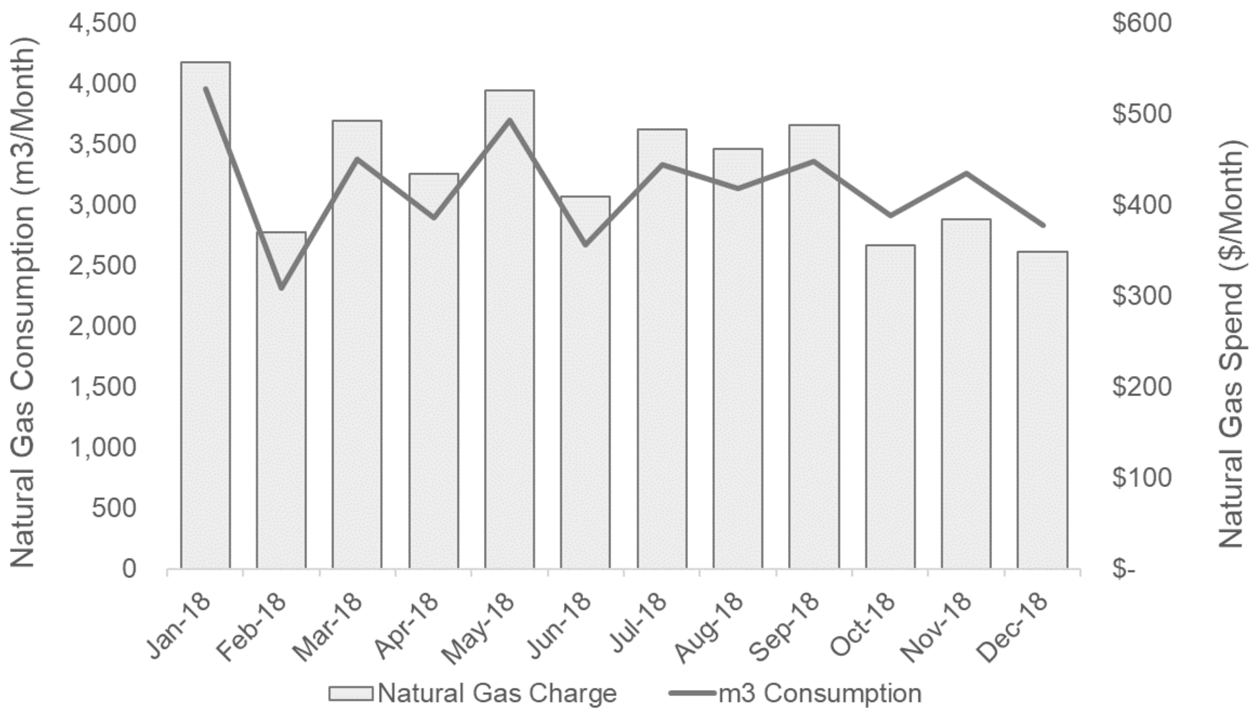

Figure 18 : Natural gas cost breakdown and consumption

Natural gas for MSH is currently provided by Enbridge on the "Rate 6" rate tariff; natural gas charges are broken out below:

Description	Cost ($)	Cost Basis
Customer Charge	$70.00	per month
Delivery Charge 1	$0.100737	per m3 for first 500m3
Delivery Charge 2	$0.079957	per m3 for next 1050m3
Delivery Charge 3	$0.065405	per m3 for the next 4500m3
Transport to Enbridge	$0.041979	per m3
Gas Supply Charge	$0.107122	per m3
Cost Adjustment	$0.014873	per m3

Note: Data from March 2019 Enbridge bill

Table 8 : Natural gas cost breakdown, Rate 6

Due to the relatively low spend associated with natural gas at the facility, further gas driver analysis and end-use breakdown determination was not performed.

4. Previous ECDMP (Jan-2014 to Dec-2018)

As part of fulfilling Regulation 397/11 of the Green Energy Act (2009), an Energy Conservation Demand Management Plan (ECDMP) was generated for Mount Sinai Hospital in July 2014, covering the 5-year period of January 2014 to December 2018. Energy conservation measures (ECMs) were identified in this report and proposed for implementation.

4.1 Past ECMs Proposed

A number of "top-down" energy conservation targets were applied against MSH's total utility cost and consumption values, to build a picture of potential achievable savings for the facility. These energy target savings are provided in the table below:

Area of Focus	Savings Target (%)	Cost Savings ($/year)
Hospital Electric Base	10%	$ 376,733
Hospital Thermal Base	14%	$ 81,768
Hospital Cooling Chilled Water	26%	$ 140,903
Hospital Thermal Heating	35%	$ 304,015
Hospital Water	19%	$ 146,699
	TOTAL	**$ 1,050,118**

Table 9: Past ECDMP energy target savings

A separate list of preliminary energy efficiency measures was then provided to provide a pathway to achieve most of the energy target savings. A list of these proposed energy efficiency measures is shown below, along with budget cost and savings estimates for each:

ECM ID	Description	Budget Cost ($)	Cost Savings ($/year)	Estimated Incentive ($)	Simple Payback (Post-Incentive) (years)
1	Ventilation refurbishment and rebalancing	$1,500,000	$ 299,637	$ 326,756	3.92
2	Ventilation system controls	$ 700,000	$ 286,744	$ 107,834	2.07
3	Steam and heating system controls	$ 235,000	$ 85,333	$ 32,788	2.37
4	Lighting retrofits	$1,060,000	$ 134,788	$ 51,842	7.48
5	Water conservation	$ 14,625	TBD	$ -	TBD
6	Department /staff engagement	$ 38,000	$ 7,932	$ 6,102	4.02
7	Energy advisor / co-ordination	$ 300,000	$ -	$ -	-
	TOTAL	**$3,847,625**	**$ 814,434**	**$ 525,322**	**4.1**

Table 10: Past ECDMP proposed energy efficiency measures

4.2 Past ECM Implementation

Mount Sinai Hospital has been undergoing a significant multi-year renovation as part of the “Renew Sinai” initiative. Since 2013 this has involved the addition of 6 new floors on the Murray Street side of the building, new neonatal and antenatal additions, revitalization of the lobby and food hall, and other improvements to the hospital’s capacity and quality of care. Portions of this initiative are still in progress at MSH.

Given the scope and timeline of the current renovation, the facility has been hesitant to proceed with measure implementation unless it is in line with a planned renovation initiative. Several of the measures identified in the 2014 ECDMP have been or are in the process of being implemented, however due to the high complexity and long timeframe of the renovation work being undertaken, it is not possible to quantify savings from these implementations as standalone measures.

Significant lighting upgrades have already been performed at MSH, an energy coordinator has been hired, and air balancing investigation is currently underway, as recommended in the 2014 ECDMP. It is also expected that further savings have been achieved as a result of the renovation process, as certain areas are upgraded with updated technology and controls in line with the above measures.

5. Updated ECDMP (Jan-2019 to Dec-2023)

As part of fulfilling Ontario Regulation 507/18 of the Electricity Act (1998), a detailed review of energy consumption at Mount Sinai Hospital has been performed, and an updated ECDMP has been generated to cover the 5-year period of January 2019 to December 2023. A number of ECMs have been identified, along with a forecast of total energy savings resulting from implementation.

5.1 Energy Conservation Measures

5.1.1 Lighting technology upgrade

Lighting is estimated to account for approximately 11% of MSH's electricity consumption. A number of areas have already undergone upgrades from fluorescent light fixtures to LEDs, however some significant areas of T5 or T8 fluorescent lighting remain throughout the building.

Upgrading these fixtures to LED equivalents would provide ongoing electricity demand and consumption savings. The preliminary economics of this project are shown below:

ID #	Energy Conservation Measure	Electricity Savings (kWh/year)	Demand Savings (kW)	Steam Savings (kWh/year)	Chilled Water Savings (kWh/year)	Total Cost Savings ($/year)	Estimated Project Cost($)	Estimated Capital Incentive ($)	Simple Payback Ex. Incentive (years)	Measure Life (years)	Savings as % of Site Cost
1)	Lighting LED Retrofits	657,000	75	-	-	$53,758	$234,375	$18,750	4.0	5	1.0%

Figure 19 : Lighting technology upgrade preliminary economics

The lifetime of this measure largely depends upon the LED fixture type chosen; fluorescent lamp "swap-in" fixtures can have a rated life of up to 50,000 hours. A lifetime of 5 years can be assumed for this measure.

5.1.2 Lighting controls improvement

As part of MSH's current renovation a number of lighting control systems have been implemented, however multiple areas of the building do not have active lighting controls and are candidates for both daylight harvesting (in conjunction with new dimmable LED fixtures if necessary) along with nighttime setback to maintain a lowered lighting level when certain areas are empty overnight.

Installing lighting controls and light level sensors in key areas, linking these back to the facility's building automation system and controlling based on light level or setback schedule would reduce electricity consumption during certain days and overnight. The preliminary economics of this project are shown below:

ID #	Energy Conservation Measure	Electricity Savings (kWh/year)	Demand Savings (kW)	Steam Savings (kWh/year)	Chilled Water Savings (kWh/year)	Total Cost Savings ($/year)	Estimated Project Cost($)	Estimated Capital Incentive ($)	Simple Payback Ex. Incentive (years)	Measure Life (years)	Savings as % of Site Cost
2)	Lighting Controls Upgrade	547,500	-	-	-	$14,387	$175,000	$54,750	8.4	> 5	0.3%

Figure 20 : Lighting controls improvement preliminary economics

This measure is expected to last over five years, however some level of ongoing review of the system will be required to ensure occupant comfort and energy savings are both optimized. Scheduling may also need to be updated periodically if and when the function of areas change.

5.1.3 Air handling unit setback

Basic information on the quantity, layout and scheduling of the main air handling units (AHUs) at MSH has been gathered from the site's building automation system (BAS). This has been combined with spot measurements and site visit data gathered during each of the main seasons to confirm or update BAS data, and understand general air flow, heating, humidifying and cooling trends throughout the year.

A detailed hourly simulation for each identified AHU has been performed by applying motor size, setpoint temperatures, return air percentage, current heat reclaim savings and average air flow against outdoor temperature and relative humidity data for 2018; a summary of the results and other pertinent information is provided below:

Air Handling System	Area Fed	Annual Motor kWh	Annual Heating / Humidifying kWh	Annual Cooling kWh	Setback Enabled?	Setback Hours	Heat Recovery?
SF-2	Operating	679,636	932,482	591,005	No	-	-
SF-3	Kitchen	481,409	1,068,306	738,768	Yes	20:00 to 4:00, 7 Days	-
SF-4	Podium General South	947,569	932,482	591,005	No	-	-
SF-5		522,797	1,813,160	1,149,177	No	-	-
SF-6	Podium General Centre	705,776	932,482	591,005	No	-	-
SF-7	Podium General North	1,470,366	1,476,430	935,758	No	-	-
SF-8	Research Laboratory	470,517	1,554,137	985,009	No	-	-
SF-13	General South	424,772	932,482	591,005	No	-	-
SF-14	Perimeter South	640,426	1,554,137	985,009	No	-	-
SF-15	Perimeter North	382,295	1,554,137	985,009	No	-	-
SF-16		287,538	932,482	591,005	No	-	-
AHU-501		104,559	248,662	157,601	No	-	-
SF-801		686,171	1,554,137	985,009	No	-	-
AHU-901		147,037	1,036,091	656,672	No	-	-
SF-1202		914,894	621,655	394,003	No	-	-
SF-1203		914,894	621,655	394,003	No	-	-
SF-1204		914,894	932,482	591,005	No	-	-
AHU 1801	Level 14/15 Surgical OR	294,073	1,085,006	627,399	No	-	Yes
AHU 1802	AHU-1801 Backup	-	-	-	No	-	Yes
AHU-1901	Level 14 Obstetrics Operation	418,237	817,559	546,062	No	-	Yes
AHU-1902	Levels 14-17 Obstetric Centre	339,818	994,648	630,406	No	-	-
AHU-1903	Levels 14-17 Obstetric South	169,909	714,903	453,104	No	-	-
AHU-1904	Levels 14-17 Obstetric North	169,909	870,317	551,605	No	-	-
AHU-2001		116,136	187,519	145,262	Yes	19:00 to 7:00, 5 Days	-
AHU-2002		156,839	238,556	169,985	Yes	20:00 to 5:00, 7 Days	-
AHU-2003		294,073	585,910	371,348	No	-	-
AHU-2004		209,119	367,901	245,728	No	-	Yes
	TOTALS	**12,863,665**	**24,559,718**	**15,652,948**			

Figure 21 : Current simulated energy consumption by air handling system

As noted in the table above, the majority of the facility's AHUs do not have any setback currently in place. In many cases supply and exhaust fans do not have variable speed drives (VSDs) installed and flow is modulated via dampers if at all.

It is also noted that the installation of VSDs alone is unlikely to bring significant savings for some systems, as in many areas there is currently no downstream method for remotely or automatically reducing air flow at point of use. Due to the complex ducting distribution and the likelihood that AHU services have been expanded beyond original intent over the years, it is likely that most units can not simply be "set back" without affecting critical areas of the building unless a comprehensive air-balancing study is performed. It is therefore expected that the ideal high-level control strategy would be to modulate flow using variable air volume (VAV) terminals installed at multiple points of use for each AHU duct network.

Given the large potential scope of this project, there are multiple ways to proceed. Installing new VSDs and VAV terminals on AHUs without setback scheduling and altering air flow depending on occupancy, room classification and other factors would provide significant electricity, heat and cooling demand savings. The preliminary economics of this project are shown below:

ID #	Energy Conservation Measure	Electricity Savings (kWh/year)	Demand Savings (kW)	Steam Savings (kWh/year)	Chilled Water Savings (kWh/year)	Total Cost Savings ($/year)	Estimated Project Cost($)	Estimated Capital Incentive ($)	Simple Payback Ex. Incentive (years)	Measure Life (years)	Savings as % of Site Cost
3)	Air Handling Unit Setback	3,753,849	-	3,817,225	1,917,461	$287,757	$2,000,000	$750,770	4.3	> 5	5.2%

Figure 22 : Air handling unit setback preliminary economics

Savings associated with this measure have been calculated via simulation, assuming a 35% air flow reduction through each AHU during the hours of 7:00 PM to 6:00 AM, 7 days per week. Determining the exact setback flow percentage and timing possible on each AHU along with an exact implementation strategy for this project will require significant detailed duct mapping and air balancing, including an analysis on each affecting room to ensure minimum air change and other regulatory thresholds are met.

Mount Sinai Hospital has already undertaken some portions of this project with VSD installation underway for fans SF-13 and SF-16 along with on EF-17 through to EF-20, enabling future setback on these systems.

This measure is expected to last over five years, and periodic rebalancing assessments are recommended to ensure the system is performing as expected.

5.1.4 Air handling unit heat reclaim

A number of opportunities for heat reclaim were also noted on the facility's air handling units; this would allow certain systems to exchange heated or cooled exhaust with fresh incoming air, recovering heat which would otherwise be lost to atmosphere. A conservative glycol loop savings percentage has been assumed and savings have been calculated over all non-shoulder season hours via simulation. The preliminary economics of this project are shown below:

ID #	Energy Conservation Measure	Electricity Savings (kWh/year)	Demand Savings (kW)	Steam Savings (kWh/year)	Chilled Water Savings (kWh/year)	Total Cost Savings ($/year)	Estimated Project Cost($)	Estimated Capital Incentive ($)	Simple Payback Ex. Incentive (years)	Measure Life (years)	Savings as % of Site Cost
4)	Air Handling Unit Heat Reclaim	- 81,687	- 19	991,800	204,217	$25,982	$300,000	$0	11.5	> 5	0.5%

Figure 23 : Air handling unit heat reclaim preliminary economics

It has been assumed that no additional systems are candidates for direct return air mixing instead of glycol heat reclaim apart from systems already implementing direct return air mixing. It has also been assumed that no systems currently using direct air return are eligible for an increased return air percentage. Utilizing return air is the ideal method of implementing heat reclaim, yielding higher reclaimed quantities of heat and lower operational costs, however determining whether each AHU could be fed some percentage or some additional percentage of return air based on end-use would require a detailed end use study. Note that the savings listed above assume that ECM 3 has been implemented to ensure savings are not double-counted.

This measure is expected to last over five years, and periodic assessments of the system are recommended to ensure heat reclaim is performing as expected.

6. Approval for ECDMP

X

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X

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