CONSERVATION AND DEMAND ENERGY MANAGEMENT PLAN

CHILDREN'S HOSPITAL OF EASTERN ONTARIO-OTTAWA CHILDREN'S TREATMENT CENTRE

June 2019

OUR VISION

"Best Life for every child and youth"

OUR MISSION

"We provide exceptional care and advance how children, youth and families obtain it through partnership, research and education"

Table of Contents

A. EXECUTIVE SUMMARY 2

B. INTRODUCTION 2

CHEO 2

CTC 3

OHSC 4

C. HISTORICAL ENERGY USE 5

Thermal Energy 5

Electrical 6

Water 7

D. ENERGY CONSERVATION PLAN 8

Baseline Energy Performance 8

Identifying Potential Conservation Opportunities 9

Implementing Improvement Measures 9

Planned Projects over the next few years 10

Evaluating the Plan and Measuring Results 10

APPENDIX A 12

APPENDIX B 15

APPENDIX C 18

A. EXECUTIVE SUMMARY

The Conservation and Demand Energy Management Plan fulfils the reporting requirements of the Ontario Regulation 507/18 (formerly 397/11) providing the Children's Hospital of Eastern Ontario-Ottawa Children's Treatment Centre (CHEO) with a framework to support continued energy and sustainability initiatives within the building environment as well as operations and programs. Implementation of all initiatives will be subject to future budget approvals.

B. INTRODUCTION

The Conservation and Demand Energy Management Plan was undertaken to respond to Ontario Regulation 507/18, requiring all broader public sector organizations to report their annual energy use to the ministry and develop energy conservation and demand management plans.

The Energy Plan has two parts:

- A listing of the annual energy consumption for each of the public agency's facilities. The first listing was submitted on July 1, 2013 for the 2011 calendar year, and is due annually thereafter.
- A description of previous, current and proposed measures for reducing the public agency's energy consumption and a forecast of expected results. The first plan was submitted in June, 2014. This document is a follow up to the original plan.

The overall goal of CHEO's Conservation and Demand Energy Management Plan is to promote responsible stewardship of natural resources. This is desirable on several fronts;

- Reducing CHEO's operating expenses from lower utility bills
- Conserving a finite resource – fossil fuels
- Limiting the environmental impact from greenhouse gas emissions (CO2)

CHEO

CHEO was conceived in the late 1960's and opened its doors to the Eastern Ontario and Western Quebec communities in May 1974. It was planned prior to the 1973 oil crisis when energy prices were low relative to today's scenario. Building Codes and Canadian Standards Association (CSA) standards related specifically to healthcare have moved forward significantly in the last 40 years to reflect the new reality of higher energy costs such that a 'new' CHEO if built today would be a more energy efficient lower cost facility to operate. CHEO is continually striving to improve its energy performance against a backdrop of energy costs escalating ahead of general inflationary trends.

The former CHEO and the Ottawa Children's Treatment Centre amalgamated in December 2016. The data presented in this report will clearly outline the new combined data.

The CHEO complex together with the CHEO Research Institute comprises the following interconnected footprint of buildings and associated wings. See Table 1 below.

TABLE 1: CHEO, ASSOCIATED WINGS AND CHEO RESEARCH INSTITUTE FOOTPRINT (WITHOUT CTC).

Address	Use	Square Footage	Number of Stories	Built (yr.)
CHEO Main Building	Hospital	397,020	7	1974
Max Keeping Wing	Clinics, offices & labs	67,000	3	2002
Garry Cardiff Wing	PICU, NICU, ER, Clinics	85,200	3	2009
Research Institute 1	Offices & labs	30,000	3	1992
Research Institute 2	Clinics, offices & labs	33,630	4	2004
	Total Area	**612,850**		

CTC

In 2016 CHEO amalgamated with the Ottawa Children Treatment Center (OCTC). This added entity is referred to in this report as the Children Treatment Centre (CTC). A 9,663 square foot extension was constructed in 2017. The CTC complex comprises the following interconnected footprint of buildings and associated wings. See Table 2 below.

TABLE 2: CTC FOOTPRINT.

Address	Use	Square Footage	Number of Stories	Built (yr.)
Children Treatment Center (CTC)	Treatment Center / School	31,921	1 + Penthouse (Mechanical room)	1973
	Administrative Office	1,019		
	Workshop	1,019		
	CTC Annex (Treatment & Administrative)	9,663	1	2017
	Total Area	**43,621**		

Total square footage for both CHEO and CTC = **656,451 sq. ft**

OHSC

The Ottawa Health Science Center site comprises CHEO, CHEO Research Institute, Roger Neilson House, The Ottawa Hospital General Campus and The University of Ottawa School of Medicine. The site is bulk invoiced by Hydro Ottawa and is also invoiced for thermal energy from TransAlta Corporation. CHEO is the administrator of the invoice and billing process for these costs. A Technical Advisory Committee (TAC) with members from all partner's deal with common issues for the site. In 2011 the site installed sub-metres to measure each partner's electricity consumption as well as their MTHW and steam consumption. They then engaged a third party, Comsatec, to collect data from all meters, re-allocate losses and provide CHEO accounting with details to assist in invoicing all partners.

Most interval meters were not installed until mid-2011.

In 2015 the entire electrical vault was replaced in a new structure to allow for future expansion. This caused requirements for metering changes as well as reprogramming to provide accurate invoicing.

In addition, Comsatec also started collecting invoices from Utilities (Electricity, Water and Natural Gas) in 2015 to provide full audit capability on reporting. Refer to Appendices A to C along with Graphs A to B for details on monthly consumption from 2012 to 2018 for all energy commodities consumed at CHEO. Data provided in this report comes from Comsatec's Database.

CHEO's costs of utilities is approximately $3.2M per year. Approximately 55% of that amount relates to thermal energy usage; steam and medium temperature hot water, 37% for Electricity and 7% for water. Refer to Table 3 for 2018 breakdown.

TABLE 3: 2018 ENERGY CONSUMPTION AND COSTS FOR CHEO & CTC

	2018 Data for CHEO + CTC				
	Consumption		**Cost**	**%**	
Electricity	17,494,932	kWh	$1,215,653	37.2%	
Hot Water	61,471	GJ	$1,219,041	37.3%	55.53%
Steam	23,929	GJ	$594,968	18.2%	
Water	56,697	M^3	$237,311	7.3%	
		Total ($)	**$3,266,973**		

C. HISTORICAL ENERGY USE

Thermal Energy

CHEO does not operate our own thermal energy plant. There are no boilers in the facility. All thermal energy (steam & medium temperature hot water) is purchased on a long term agreement from the TransAlta Corporation who own and operate a combined heat and power plant located adjacent to the CHEO building. The agreement with TransAlta runs until January 1, 2024.

(Note: TransAlta supplies thermal energy to all facilities on the Ottawa Health Sciences Corporation [OHSC] site comprising CHEO; CHEO Research Institute, The Ottawa Hospital General Campus; and The University of Ottawa School of Medicine)

Steam is primarily used for sterilization and humidification. Medium temperature hot water (MTHW) is used for building heating systems and domestic hot water production. Appendix A provides the thermal energy consumption on a monthly basis for the periods 2012 to 2018, as well as Graphic A for illustration. **Note that CHEO has all the data from 2012 onwards whereas the CTC only has data from 2016 onwards.**

In 2018 Approximately 68.8% of thermal energy usage is MTHW and 31.2% is steam usage.

The monthly Steam Consumption for CHEO and CTC from 2012 to 2018 is presented in Table 4.

TABLE 4: CHEO + CTC STEAM CONSUMPTION (GJ).

	2012	2013	2014	2015	2016	2017	2018
Jan	3,065	2,269	2,053	2,739	2,734	2,776	2,950
Feb	2,994	2,207	1,668	2,609	2,628	2,775	2,754
Mar	2,674	2,409	2,077	2,538	2,407	3,172	3,236
Apr	2,701	1,672	1,641	1,691	2,089	2,058	2,733
May	1,746	883	1,184	1,291	1,638	1,667	1,795
Jun	1,131	784	1,198	1,546	1,335	1,374	1,634
Jul	890	782	1,297	1,580	1,570	1,559	1,674
Aug	963	783	1,307	1,580	1,538	1,159	1,522
Sep	827	778	944	1,322	1,499	965	1,034
Oct	1,729	851	1,193	1,355	1,803	1,248	1,810
Nov	1,854	1,079	1,463	1,416	2,022	2,427	2,353
Dec	2,048	2,138	2,231	1,632	2,774	2,950	3,133
Total	**22,622**	**16,635**	**18,256**	**21,299**	**24,037**	**24,130**	**26,628**

Data from CTC is included in this table from 2016 onwards and increases the consumption by approximately 3,000 GJ per year

The total Medium Temperature Hot Water (MTHW) consumption for CHEO from 2012 to 2018 is presented in Table 5 (Note that CTC does not consume MTHW).

TABLE 5: CHEO MTHW (GJ)

	2012	2013	2014	2015	2016	2017	2018
Jan	6,052	6,216	6,926	8,038	6,382	5,989	8,308
Feb	4,341	5,410	5,370	8,106	6,195	5,483	6,138
Mar	3,778	4,336	5,240	5,073	4,844	6,268	5,494
Apr	3,025	3,349	3,636	3,220	3,870	3,664	4,509
May	3,573	3,218	3,211	2,939	3,073	3,751	3,473
Jun	3,138	3,102	2,594	2,728	2,805	3,409	3,295
Jul	2,863	2,926	2,601	2,611	3,009	3,342	3,055
Aug	3,011	3,011	2,708	2,628	3,015	3,463	2,986
Sep	2,989	3,349	2,679	2,634	3,013	3,109	3,202
Oct	2,990	3,462	3,036	3,459	3,504	3,838	4,147
Nov	3,974	4,127	3,980	1,394	3,671	5,058	6,161
Dec	5,426	6,262	5,087	4,113	6,109	8,308	8,004
Total	**45,160**	**48,768**	**47,068**	**46,943**	**49,490**	**55,682**	**58,772**

Consumption for MTHW has increased since 2016. This in part is anticipated to be related to weather conditions. Future reports will include degree days which should provide a better representation on energy consumption.

Electrical

Electricity is purchased at high voltage from Ottawa Hydro. Consumption patterns and totals for the period 2012 to 2018 are shown in Table 6. Appendix B presents all of the data as well as Graphic B for illustration. Note that CTC's consumption was added as of January 2016. CTC's annual consumption is approximately 350,000 kWh/yr.

The data indicates that energy conservation measures since 2012 have been successful in that the total consumption in 2018 which includes CTC is lower that the 2012 consumption. The data also shows a steady decline in consumption from 2012 until CTC was added.

TABLE 6: CHEO + CTC (KWH)

	2012	2013	2014	2015	2016	2017	2018
Jan	1,282,696	1,304,008	1,281,895	1,305,070	1,298,385	1,282,524	1,306,957
Feb	1,203,249	1,189,589	1,155,596	1,189,832	1,215,668	1,157,752	1,159,809
Mar	1,331,266	1,276,256	1,222,978	1,290,868	1,302,701	1,282,613	1,262,930
Apr	1,265,894	1,266,113	1,222,978	1,256,870	1,331,107	1,261,032	1,232,494
May	1,591,917	1,541,848	1,468,458	1,526,802	1,495,144	1,438,953	1,560,586
Jun	1,690,998	1,620,206	1,609,567	1,558,493	1,595,905	1,623,830	1,628,797
Jul	1,833,593	1,870,903	1,688,614	1,803,032	1,819,140	1,807,411	1,913,246
Aug	1,843,811	1,726,335	1,659,318	1,745,174	1,884,988	1,743,833	1,929,666
Sep	1,539,833	1,488,006	1,500,280	1,639,010	1,595,990	1,653,725	1,664,497
Oct	1,389,029	1,394,948	1,377,582	1,289,684	1,354,173	1,450,568	1,356,133
Nov	1,264,274	1,221,872	1,292,689	1,226,504	1,233,112	1,293,289	1,221,056
Dec	1,279,224	1,262,398	1,292,689	1,223,018	1,258,368	1,274,855	1,258,761
Totals	17,515,784	17,162,482	16,772,644	17,054,355	17,384,682	17,270,385	17,494,932

Water

In 2015 Comsatec started collecting water usage data for CHEO. Refer to Appendix C for the monthly usage. Table 7 below gives the total water consumption for CHEO. Note that this does not include CTC as there was no data available.

TABLE 7: CHEO WATER CONSUMPTION (CUBIC METERS)*

	2015	2016	2017
Jan	8,677	6,085	5,551
Feb	7,637	5,597	5,203
Mar	8,439	6,485	9,231
Apr	10,890	5,282	5,830
May	10,078	6,798	8,570
Jun	10,748	8,714	9,744
Jul	8,945	9,842	10,130
Aug	8,651	9,578	11,128
Sep	8,750	8,903	6,614
Oct	6,889	6,808	5,356
Nov	6,213	6,248	3,946
Dec	5,737	5,685	5,075
Totals	101,654	86,025	86,378

Note*: CHEO main incoming water meter was found to be defective in early 2019. Therefore, the water consumption numbers for 2018 were not included in Table 7.

In combining all energy components and converting energy units to a common MJ and then using a MJ per area of building (square feet) a clear energy reduction is seen from 2012 to 2014. Then the added CTC load in 2016 increases the MJ/ft2 (See Table 8).

TABLE 8: ENERGY INTENSITY AND METRICS

	Thermal		Electrical			Total MJ	Total MJ/ft^2
	Total MJ/YR	MJ/ft^2	Total KWh/YR	eMJ/YR	MJ/ft^2		
2012	67,782,000	110.60	17,515,784	63,056,822	102.89	130,838,822	213.50
2013	65,403,000	106.72	17,132,482	61,676,935	100.64	127,079,935	207.37
2014	65,324,000	106.59	16,772,644	60,381,518	98.53	125,705,518	205.12
2015	68,242,000	111.36	17,054,355	61,395,678	100.18	129,637,678	211.54
2016	73,527,000	113.68	17,384,682	62,584,856	96.76	136,111,856	210.44
2017	79,812,000	121.58	17,270,385	62,173,388	94.71	141,985,388	216.29
2018	85,400,000	130.09	17,494,932	62,981,755	95.94	148,381,755	226.04

Where the total square footage used in this table are:

2012 to 2016 = 612,830 ft^2 CHEO

2016 to 2017 = 646,788 ft^2 CHEO + CTC

2017 to 2018 = 656,451 ft^2 CHEO + CTC + CTC Annex

Converting factor used:

1 MJ = 0.277777778 KWh

With the addition of CTC the thermal energy consumption has increased. The consumption data are however not weather compensated using degree day information.

D. ENERGY CONSERVATION PLAN

CHEO's conservation plan is made up of four key elements:

- Baseline Energy Performance
- Identifying Potential Conservation Opportunities
- Implementing Improvement Measures
- Evaluating the Plan and Measuring Results

Baseline Energy Performance

CHEO is a 40 year old facility and over two thirds (~400,000 ft^2) of its space is original construction. Conceived and built in a time when energy was relatively cheap (pre-1973 oil crisis) it has by modern standards an inefficient building envelope.

CHEO needs to benchmark its energy consumption with similar vintage hospitals to plan for future energy saving initiatives. For the purpose of this plan 2011 to 2013 data will be used to establish baselines for thermal and electrical energy performance. See Graphics A and B in the Appendix section at the end of this document.

Comsatec is monitoring CHEO's consumption and plans to incorporate degree days to normalize data within the next 2 years.

Identifying Potential Conservation Opportunities

During the last several years CHEO has had large capital projects underway. It was necessary to place a number of energy management projects on hold. There will be a renewed focus in energy management going forward. Each year the Conservation Plan will be updated with the prioritized projects approved using CHEO's capital infrastructure planning process. Many such opportunities exist to reduce the environmental impact of CHEO's operation as the examples below illustrate.

Implementing Improvement Measures

Since 2014, CHEO has completed the following projects:

- Renovation of an inpatient unit with replacement of 5 VAV boxes incorporating DDC control systems
- Total renovation of the 3rd floor daycare surgery suite (~$10M) which included replacing all the lighting systems and HVAC controls.
- Replacement of thermal heat wheel recovery systems on 2 of the 8 main air handling systems (100% fresh air)
- Ongoing lighting conversion to LED and successfully participating in Ottawa Hydro incentives program.
- Replacement of a high energy use 1997 Magnetic Resonance Imaging (MRI) diagnostic machine which has an anticipated electrical energy saving of 10-15% in 2015.
- Undertaking a long range Master Plan for the CHEO site over a 5 to 20 year timeframe. This plan will include the adaptation; replacement and upgrading of the existing building portfolio balanced against emerging demographic trends in pediatric medicine in the Eastern Ontario catchment area served by CHEO. Energy efficiency and operating costs of the facilities will be a key component of the plan.
- Incorporate within our procurement processes evaluation of carbon and/or Green impact analysis.
- Replacement of the Electrical Vault for the Smyth Site (vault is used by CHEO, TOH and the University of Ottawa) completed in 2015.
- Annual roofing replacement. When roof replacement occurs the facility automatically increases membrane insulation on roofing systems.

- Code compliancy, replaced all steam pressure relief valves (PRV's)
- High Pressure Flash Tank has been venting low pressure steam to atmosphere for over 20 years. A heat exchanger was installed and this low pressure steam is now pre-heating domestic cold water intake. This is reducing use of Medium Temperature Hot water.
- CHEO introduced a distributed Siemens Apogee DDC building management system in 1991 which is progressively replacing the original pneumatic controls systems throughout the building. Every renovation or remodeling project incorporates replacement of the pneumatic controls. Approximately 1/3rd of the original 1974 building has been completed. All the newer building additions are fully DDC such that overall approximately **65%** of the facility has DDC controls. Increasing penetration of DDC into the older HVAC systems will be a priority for the hospital.

Planned Projects over the next few years

The planned projects include:

1) Replacement of 5 walk-in coolers
    - These have been running water to drain for past 45 years
    - Planning to have the design self-ready by end of 2019-2020 Fiscal year.
2) Medical Air System and Dryer replacement
    - Triplex system replaced with newer technology
3) Elevator Replacement program
    - Replacing all elevators with open source systems
4) Exploring energy management performance
5) LED parking Lot and Roadway retrofit
6) Air Handler Upgrades
    - VFD upgrades 7 & 8 air handlers (expected up to 50% savings)
7) Replacing Catheterization Laboratory and Interventional Suite
8) Conversion to LED throughout their Facility (in progress)
9) Steam trap audit
10) Comsatec to program degree days to normalize data sets

Evaluating the Plan and Measuring Results

CHEO will continue to provide the Energy consumption profiles and will track their Greenhouse Gas Emissions. Additionally CHEO will strive to set reporting processes on:

- Current and proposed measures conserving, reducing, and managing demand for energy
- Annually update current and proposed measures and targeted results
- Report on improvement initiatives with corresponding results

CHEO is committed to ensure the “Plan” continues to evolve and improve over the next five years. The Master Planning exercise currently being undertaken will provide the needed foundation to plan all “buildings” for the future and their related energy consumption

APPENDIX A

Below is the thermal energy consumption data on a monthly basis for the periods 2012 to 2018, as well as Graphic A for illustration.

CHEO Hot Water (GJ)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Total**
2011					3,867	3,281	2,967	2,950	2,852	3,714	3,093	4,985	**27,709**
2012	6,052	4,341	3,778	3,025	3,573	3,138	2,863	3,011	2,989	2,990	3,974	5,426	**45,160**
2013	6,216	5,410	4,336	3,349	3,218	3,102	2,926	3,011	3,349	3,462	4,127	6,262	**48,768**
2014	6,926	5,370	5,240	3,636	3,211	2,594	2,601	2,708	2,679	3,036	3,980	5,087	**47,068**
2015	8,038	8,106	5,073	3,220	2,939	2,728	2,611	2,628	2,634	3,459	1,394	4,113	**46,943**
2016	6,382	6,195	4,844	3,870	3,073	2,805	3,009	3,015	3,013	3,504	3,671	6,109	**49,490**
2017	5,989	5,483	6,268	3,664	3,751	3,409	3,342	3,463	3,109	3,838	5,058	8,308	**55,682**
2018	8,308	6,138	5,494	4,509	3,473	3,295	3,055	2,986	3,202	4,147	6,161	8,004	**58,772**

CHEO Steam (GJ)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Total**
2011					1,069	1,027	1,011	1,049	1,003	1,051	1,221	2,009	**9,440**
2012	3,065	2,994	2,674	2,701	1,746	1,131	890	963	827	1,729	1,854	2,048	**22,622**
2013	2,269	2,207	2,409	1,672	883	784	782	783	778	851	1,079	2,138	**16,635**
2014	2,053	1,668	2,077	1,641	1,184	1,198	1,297	1,307	944	1,193	1,463	2,231	**18,256**
2015	2,739	2,609	2,538	1,691	1,291	1,546	1,580	1,580	1,322	1,355	1,416	1,632	**21,299**
2016	2,283	2,210	2,015	1,826	1,469	1,236	1,529	1,526	1,432	1,555	1,727	2,333	**21,141**
2017	2,319	2,350	2,737	1,767	1,514	1,313	1,248	1,127	892	1,054	2,131	2,544	**20,996**
2018	2,544	2,416	2,882	2,415	1,621	1,468	1,511	1,513	790	1,680	2,185	2,904	**23,929**

Total CHEO (GJ)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Total**
2011	0	0	0	0	4,936	4,308	3,978	3,999	3,855	4,765	4,314	6,994	**37,149**
2012	9,117	7,335	6,452	5,726	5,319	4,269	3,753	3,974	3,816	4,719	5,828	7,474	**67,782**
2013	8,485	7,617	6,745	5,021	4,101	3,886	3,708	3,794	4,127	4,313	5,206	8,400	**65,403**

2014	8,979	7,038	7,317	5,277	4,395	3,792	3,898	4,015	3,623	4,229	5,443	7,318	**65,324**
2015	10,777	10,715	7,611	4,911	4,230	4,274	4,191	4,208	3,956	4,814	2,810	5,745	**68,242**
2016	8,665	8,405	6,859	5,696	4,542	4,041	4,538	4,541	4,445	5,059	5,398	8,442	**70,631**
2017	8,308	7,833	9,005	5,431	5,265	4,722	4,590	4,590	4,001	4,892	7,189	10,852	**76,678**
2018	10,852	8,554	8,376	6,924	5,094	4,763	4,566	4,499	3,992	5,827	8,346	10,908	**82,701**

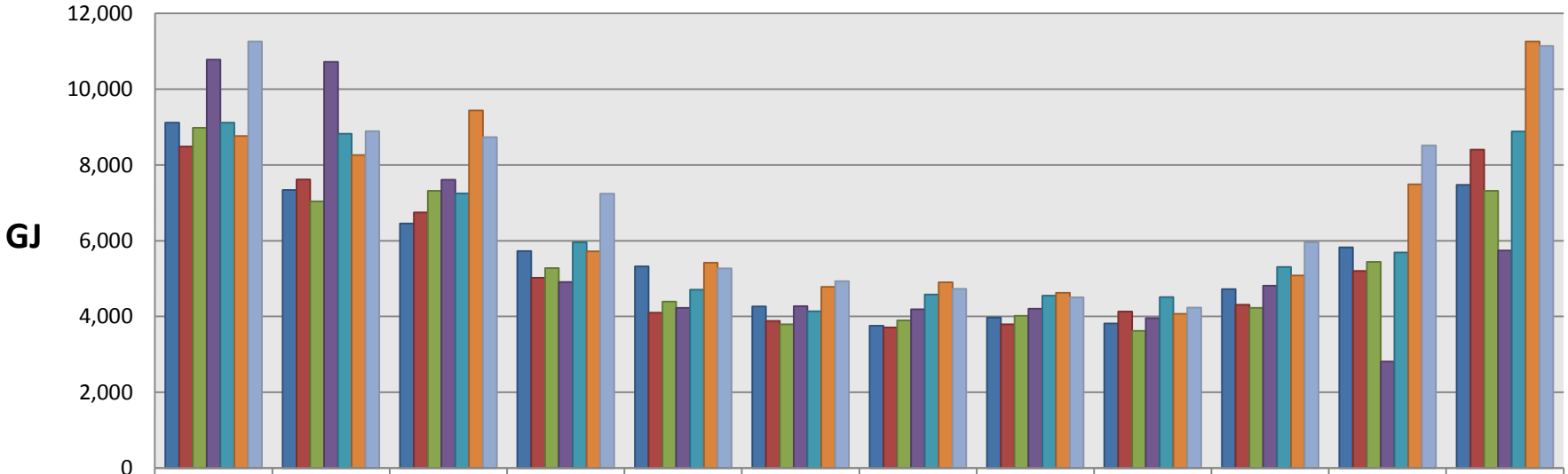
CTC
Steam

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Total**
2011													**0**
2012	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2013	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2014													**0**
2015													**0**
2016	451	418	392	263	169	99	41	12	67	248	295	441	**2,896**
2017	457	425	435	291	153	61	311	32	73	194	296	406	**3,134**
2018	406	338	354	318	174	166	163	9	244	130	168	229	**2,699**

Total Enthalpy CHEO + CTC

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Total**
2011	0	0	0	0	4,936	4,308	3,978	3,999	3,855	4,765	4,314	6,994	**37,149**
2012	9,117	7,335	6,452	5,726	5,319	4,269	3,753	3,974	3,816	4,719	5,828	7,474	**67,782**
2013	8,485	7,617	6,745	5,021	4,101	3,886	3,708	3,794	4,127	4,313	5,206	8,400	**65,403**
2014	8,979	7,038	7,317	5,277	4,395	3,792	3,898	4,015	3,623	4,229	5,443	7,318	**65,324**
2015	10,777	10,715	7,611	4,911	4,230	4,274	4,191	4,208	3,956	4,814	2,810	5,745	**68,242**
2016	9,116	8,823	7,251	5,959	4,711	4,140	4,579	4,553	4,512	5,307	5,693	8,883	**73,527**
2017	8,765	8,258	9,440	5,722	5,418	4,783	4,901	4,622	4,074	5,086	7,485	11,258	**79,812**
2018	11,258	8,892	8,730	7,242	5,268	4,929	4,729	4,508	4,236	5,957	8,514	11,137	**85,400**

GRAPHIC A: CHEO + CTC MONTHLY ENTHALPY DATA



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	9,117	7,335	6,452	5,726	5,319	4,269	3,753	3,974	3,816	4,719	5,828	7,474
2013	8,485	7,617	6,745	5,021	4,101	3,886	3,708	3,794	4,127	4,313	5,206	8,400
2014	8,979	7,038	7,317	5,277	4,395	3,792	3,898	4,015	3,623	4,229	5,443	7,318
2015	10,777	10,715	7,611	4,911	4,230	4,274	4,191	4,208	3,956	4,814	2,810	5,745
2016	9,116	8,823	7,251	5,959	4,711	4,140	4,579	4,553	4,512	5,307	5,693	8,883
2017	8,765	8,258	9,440	5,722	5,418	4,783	4,901	4,622	4,074	5,086	7,485	11,258
2018	11,258	8,892	8,730	7,242	5,268	4,929	4,729	4,508	4,236	5,957	8,514	11,137

APPENDIX B

Below is the electricity consumption data for CHEO and CTC for the period 2012 to 2018. Graphic B illustrates the totals consumption for CHEO+CTC.

CHEO KWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Totals**
2012	1,282,696	1,203,249	1,331,266	1,265,894	1,591,917	1,690,998	1,833,593	1,843,811	1,539,833	1,389,029	1,264,274	1,279,224	**17,515,784**
2013	1,304,008	1,189,589	1,276,256	1,266,113	1,541,848	1,620,206	1,870,903	1,726,335	1,488,006	1,394,948	1,221,872	1,262,398	**17,162,482**
2014	1,281,895	1,155,596	1,222,978	1,222,978	1,468,458	1,609,567	1,688,614	1,659,318	1,500,280	1,377,582	1,292,689	1,292,689	**16,772,644**
2015	1,305,070	1,189,832	1,290,868	1,256,870	1,526,802	1,558,493	1,803,032	1,745,174	1,639,010	1,289,684	1,226,504	1,223,018	**17,054,355**
2016	1,267,621	1,185,924	1,274,630	1,303,828	1,469,290	1,569,867	1,793,722	1,859,720	1,570,720	1,329,540	1,207,514	1,232,898	**17,065,274**
2017	1,255,667	1,131,891	1,254,565	1,236,448	1,412,593	1,598,482	1,778,700	1,716,213	1,628,192	1,423,188	1,267,737	1,246,174	**16,949,851**
2018	1,274,848	1,131,246	1,233,089	1,204,594	1,531,721	1,600,412	1,884,661	1,900,483	1,636,568	1,326,530	1,191,512	1,227,184	**17,142,846**

CHEO KW

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Totals**
2012	2,136	2,096	2,761	2,819	3,452	3,248	3,280	3,174	3,224	2,731	2,075	2,084	**33,080**
2013	2,086	2,152	2,020	2,704	3,241	3,343	3,401	3,068	3,197	2,837	2,460	2,058	**32,567**
2014	2,088	2,057	2,743	2,743	3,007	2,933	2,973	3,127	3,171	2,823	2,607	2,104	**32,375**
2015	2,013	2,079	2,083	2,482	3,032	3,164	3,339	2,806	3,038	2,429	2,611	2,022	**31,098**
2016	2,076	2,040	2,064	0	2,965	3,138	3,156	3,220	3,344	2,802	2,316	2,008	**29,128**
2017	2,053	2,040	1,977	2,863	3,082	3,185	3,136	3,150	3,202	2,916	2,125	1,972	**31,701**
2018	2,010	2,031	1,967	2,385	3,184	3,275	3,364	3,357	3,345	3,159	1,967	1,982	**32,025**

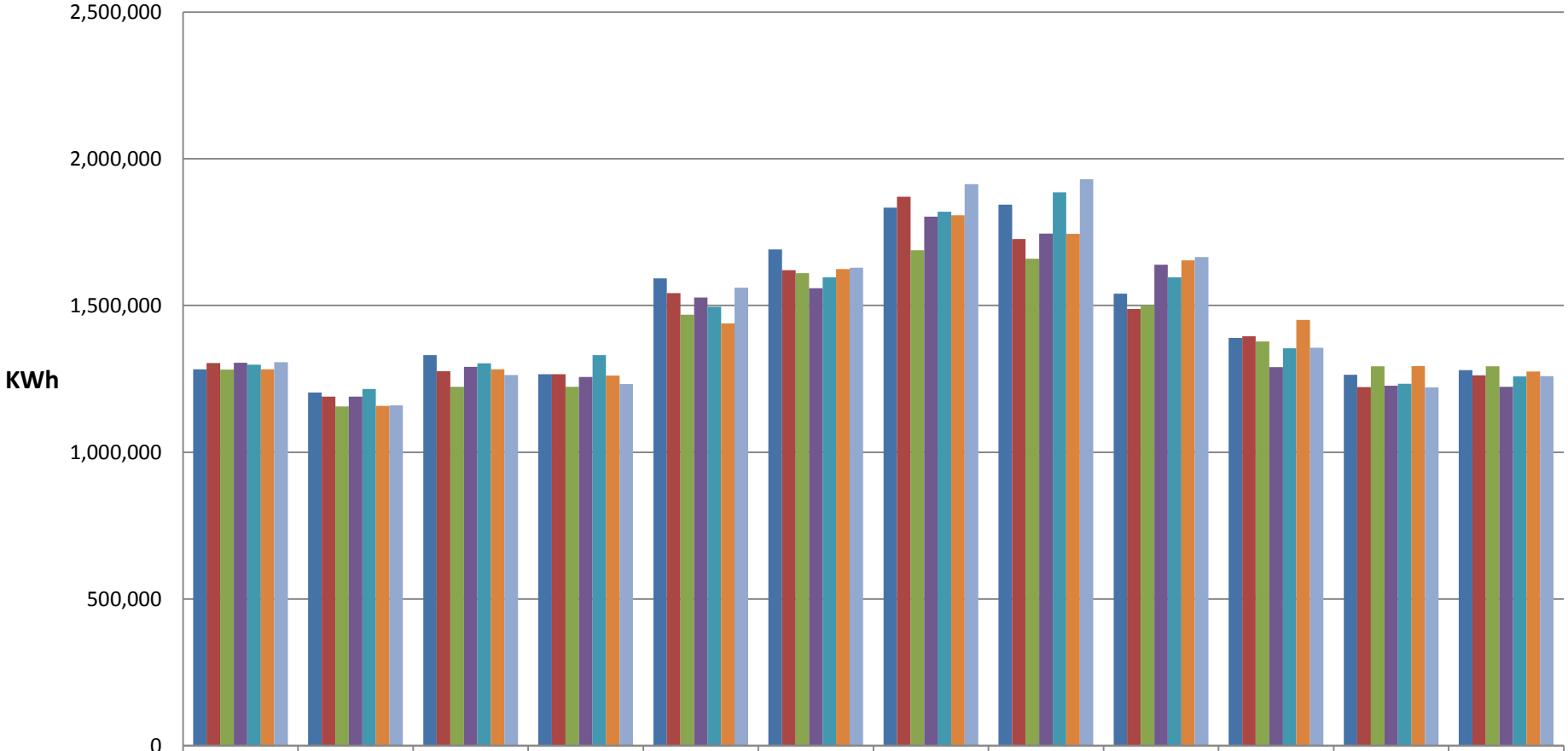
CTC KWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Totals**
2012													**0**
2013													**0**
2014													**0**
2015													**0**
2016	30,764	29,744	28,072	27,279	25,854	26,038	25,418	25,268	25,270	24,632	25,598	25,471	**319,408**
2017	26,857	25,862	28,048	24,584	26,360	25,348	28,711	27,619	25,533	27,380	25,552	28,681	**320,534**
2018	32,109	28,563	29,842	27,900	28,865	28,385	28,585	29,184	27,929	29,603	29,544	31,577	**352,086**

CTC KW

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Totals**
2012	74	71	58	54	64	65	56	58	64	54	64	66	**748**
2013	67	84	68	57	64	62	59	59	57	55	52	58	**743**
2014	73	69	70	56	60	54	58	58	60	57	56	66	**736**
2015	75	74	67	57	58	58	56	47	54	50	60	65	**722**
2016	70	71	63	0	47	55	49	50	58	53	54	55	**626**
2017	57	61	58	41	49	53	56	52	54	53	45	58	**636**
2018	63	58	55	52	53	52	53	53	53	48	54	59	**653**

GRAPHIC B: CHEO + CTC MONTHLY CONSUMPTION (KWH)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	1,282,696	1,203,249	1,331,266	1,265,894	1,591,917	1,690,998	1,833,593	1,843,811	1,539,833	1,389,029	1,264,274	1,279,224
2013	1,304,008	1,189,589	1,276,256	1,266,113	1,541,848	1,620,206	1,870,903	1,726,335	1,488,006	1,394,948	1,221,872	1,262,398
2014	1,281,895	1,155,596	1,222,978	1,222,978	1,468,458	1,609,567	1,688,614	1,659,318	1,500,280	1,377,582	1,292,689	1,292,689
2015	1,305,070	1,189,832	1,290,868	1,256,870	1,526,802	1,558,493	1,803,032	1,745,174	1,639,010	1,289,684	1,226,504	1,223,018
2016	1,298,385	1,215,668	1,302,701	1,331,107	1,495,144	1,595,905	1,819,140	1,884,988	1,595,990	1,354,173	1,233,112	1,258,368
2017	1,282,524	1,157,752	1,282,613	1,261,032	1,438,953	1,623,830	1,807,411	1,743,833	1,653,725	1,450,568	1,293,289	1,274,855
2018	1,306,957	1,159,809	1,262,930	1,232,494	1,560,586	1,628,797	1,913,246	1,929,666	1,664,497	1,356,133	1,221,056	1,258,761

APPENDIX C

Below is the monthly water usage data for CHEO from 2015 to 2017. Note that the CHEO main incoming water meter was found to be defective in early 2019. Therefore, the water consumption numbers for 2018 were not included in this report.

Note that the table below does not include CTC water usage as there was no data available at this time.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Total**
CHEO	**2015**	8,677	7,637	8,439	10,890	10,078	10,748	8,945	8,651	8,750	6,889	6,213	5,737	**101,654**
Total Water (m3)	**2016**	6,085	5,597	6,485	5,282	6,798	8,714	9,842	9,578	8,903	6,808	6,248	5,685	**86,025**
	2017	5,551	5,203	9,231	5,830	8,570	9,744	10,130	11,128	6,614	5,356	3,946	5,075	**86,378**