



**CONSERVATION AND DEMAND ENERGY MANAGEMENT PLAN  
CHILDREN'S HOSPITAL OF EASTERN ONTARIO**

**June 2024**



**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
	1Door4Care .....	4
	Garage .....	5
C.	HISTORICAL ENERGY USE .....	6
	Thermal Energy .....	6
	Electrical .....	7
	Water .....	9
D.	ENERGY CONSERVATION PLAN .....	10
	Baseline Energy Performance .....	10
	Identifying Potential Conservation Opportunities .....	11
	Implementing Improvement Measures .....	11
	Planned Projects over the next few years .....	12
	Evaluating the Plan and Measuring Results .....	14
E.	Forecast .....	14
	APPENDIX A .....	16
	APPENDIX B .....	19
	APPENDIX C .....	22

## A. EXECUTIVE SUMMARY

The Ontario Regulation 25/23 (formerly 507/18) was established to help public agencies better understand their energy usage, develop conservation plans to guide energy savings and demonstrate government leadership in conservation. This report fulfils the reporting requirements of the Energy Reporting and Conservation and demand Management Plans, Ontario Regulation 25/23 providing the Hospital with a framework to support continued energy, sustainability, and green initiatives within the built environment as well as operations and programs. Implementation of all initiatives will be subject to future budget approvals.

## B. INTRODUCTION

Ontario Regulation 25/23 Broader Public Sector Energy Reporting and Conservation and Demand Management Plans requires Broader Public Sector (BPS) organizations to develop an Energy Conservation and Demand Management (CDM) plan and update it every five years. Our updated CDM plan was developed in compliance with the regulation and covers the period from 2025 to 2029.

The energy conservation and demand management plan is composed of two parts as follows:

1. A summary of the public agency's annual energy consumption and greenhouse gas emissions for its operations.
2. A description of previous, current, and proposed measures for conserving and otherwise reducing the amount of energy consumed by the public agency's operations and for managing the public agency's demand for energy, including a forecast of the expected results of current and proposed measures.

The overall goal of the Children's Hospital of Eastern Ontario (CHEO) 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 (CO<sub>2</sub>)

### *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 50 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 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
<b>Total Area</b>		<b>612,850</b>		

### *CTC*

In 2016 CHEO took over the Ottawa Children Treatment Center (OCTC) under its portfolio. This added entity is now referred to 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
<b>Total Area</b>		<b>43,621</b>		

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

## *OHSC*

The Ottawa Health Science Center site comprises CHEO, 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 receives the invoices for Hydro, as well as Steam and Medium Temperature Hot Water (MTHW), pay for the invoices and then re-invoice all partners. A Technical Advisory Committee (TAC) with members from all partner's deal with common issues for the site. In 2011 the TAC committee had sub-metering installed 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 2023 for all energy commodities consumed at CHEO and CTC. Data provided in this report comes from Comsatec's Database.

CHEO and CTC spend around \$4M per year on utilities. Approximately 34% of that amount relates to thermal energy usage; steam and medium temperature hot water, 52% for electricity and 14% for water. Refer to Table 3 for 2023 breakdown.

**TABLE 3: 2023 ENERGY CONSUMPTION AND COSTS FOR CHEO & CTC**

2023 Data for CHEO + CTC					
	Consumption		Cost	%	
Electricity	16,559,722	kWh	\$2,118,679	52.3%	
Hot Water	57,270	GJ	\$1,081,622	26.7%	} 33.6%
Steam	18,308	GJ	\$281,407	6.9%	
Water	121,113	M <sup>3</sup>	\$571,564	14.1%	
<b>Total (\$)</b>			<b>\$4,053,272</b>		

## *1Door4Care*

CHEO is planning to expand hospital facilities within the existing CHEO campus. To be completed in 2027, 1Door4Care will be added to CHEO's Smyth Road campus as a state-of-the-art, purpose-built

integrated treatment centre. It will improve care and increase access to services for kids and youth living with complex medical, developmental, behavioural, or mental health needs.

Connected by a link to the main hospital building, this new 220,000 square-foot state-of-the-art facility will include medical clinics, treatment rooms, family support spaces, a school, a preschool and a range of multi-use clinical areas.

The energy performance of the 1Door4Care – CHEO Integrated Treatment Centre Project has been a major focus of the design, with all disciplines engaged to optimize the energy performance of the building. The building design has been evaluated using a whole life approach considering energy cost, operating costs, and capital costs in order to achieve the optimal design solution.

The mandatory energy requirement prescribed in the Output Specification is listed below:

- Total Energy Use Intensity (TEUI): 0.95 GJ/m<sup>2</sup>/year
- Thermal Energy Demand Intensity (TEDI): 0.32 GJ/m<sup>2</sup>/year
- Greenhouse Gas Intensity (GHGI): 20 kg eCO<sub>2</sub>/m<sup>2</sup>/year
- A minimum ten (10) points for Credit EAc2: Optimize Energy Performance, as required for LEED V4 BD+C

## *Garage*

As part of CHEO's expansion, a new 33,500 m<sup>2</sup> (360,591 Sq.ft) parking garage will also be constructed within the CHEO campus. The parking garage is currently under construction, prior to the 1D4C expansion. The parking garage will be in the northwest quadrant of the intersection of General Hospital Access Road and Ring Road (E-W). The parking garage is expected to be a 7-storey structure that houses 1,083 parking spaces, including an open-air roof level. The first two floors of the proposed structure will service visitor parking demand and the 5 floors above will service staff parking demand. It is anticipated that this parking garage will be constructed and open for use by spring 2025.

## C. HISTORICAL ENERGY USE

### *Thermal Energy*

CHEO and CTC do not operate their 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, 2027 with a possibility of extension for another five years. The facility is currently TransAlta have a contract with the Independent Electricity System Operator (IESO) to sell electrical energy from the plant into the Provincial grid.

(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; The University of Ottawa School of Medicine and the Children’s Treatment Centre)

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 2023, 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 2023 approximately 75.8% of thermal energy usage is MTHW and 24.2% is steam usage.

The monthly Steam Consumption for CHEO and CTC from 2012 to 2023 is presented in Table 4.

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

	2018	2019	2020	2021	2022	2023
Jan	2,950	3,291	3,280	2,454	2,582	2,704
Feb	2,754	2,952	2,695	2,320	2,434	2,643
Mar	3,236	2,997	2,546	2,443	2,456	2,954
Apr	2,733	2,203	2,529	1,550	2,206	1,710
May	1,795	1,787	2,201	891	1,150	1,008
Jun	1,634	1,562	854	892	743	947
Jul	1,674	1,498	816	1,108	796	805
Aug	1,522	1,321	829	1,033	745	835
Sep	1,034	1,037	870	1,034	760	853
Oct	1,810	1,648	1,226	1,031	786	763
Nov	2,353	1,892	1,850	996	1,013	1,121
Dec	3,133	2,701	2,477	1,997	2,573	1,963
<b>Total</b>	<b>26,628</b>	<b>24,889</b>	<b>22,173</b>	<b>17,749</b>	<b>18,244</b>	<b>18,308</b>

Data from CTC is included in this table from 2016 onwards and increases the consumption by approximately 3,000 GJ per year. In addition, steam consumption at CHEO also increased from 2015 as well.

The total Medium Temperature Hot Water (MTHW) consumption for CHEO from 2012 to 2023 is presented in Table 5 (Note that CTC does not consume MTHW).

**TABLE 5: CHEO MTHW (GJ)**

	2018	2019	2020	2021	2022	2023
Jan	8,308	9,299	6,577	6,182	9,999	5,904
Feb	6,138	7,256	6,625	5,959	7,739	6,364
Mar	5,494	5,611	6,141	4,599	5,574	4,854
Apr	4,509	3,895	4,000	3,716	4,906	4,113
May	3,473	3,579	4,720	3,528	3,942	4,173
Jun	3,295	3,432	3,378	2,962	3,466	3,811
Jul	3,055	3,186	2,936	2,996	3,382	3,878
Aug	2,986	3,562	3,070	2,634	3,400	4,449
Sep	3,202	3,615	3,400	2,824	3,515	4,047
Oct	4,147	3,418	3,893	3,562	3,676	4,616
Nov	6,161	5,115	3,687	4,453	4,218	5,155
Dec	8,004	5,938	5,340	5,641	3,755	5,906
<b>Total</b>	<b>58,772</b>	<b>57,906</b>	<b>53,767</b>	<b>49,056</b>	<b>57,573</b>	<b>57,270</b>

*Data for the years 2021, 2022, and 2023 contain errors that will be corrected in future reports. The errors are due to miscalculated network losses allocated to CHEO, caused by a faulty meter at TOH. Actual network losses are smaller, so the total MTHW consumed by CHEO (in GJ) will be lower after the correction.*

### *Electrical*

Electricity is purchased at high voltage from Ottawa Hydro. Consumption patterns and totals for the period 2015 to 2023 are shown in Table 6. Additionally, APPENDIX B contains detailed data and Graphic-B for illustration. Electrical consumption includes primary transformer loss factor.

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 still lower than the 2012 consumption. The data also shows a steady decline in consumption from 2012 until CTC was added.



**TABLE 6: CHEO + CTC (KWH)**

	2018	2019	2020	2021	2022	2023
Jan	1,315,060	1,309,476	1,258,834	1,281,867	1,243,419	1,223,118
Feb	1,167,000	1,165,701	1,173,274	1,163,772	1,130,198	1,117,720
Mar	1,270,760	1,263,195	1,208,571	1,285,284	1,270,960	1,221,530
Apr	1,240,135	1,233,708	1,126,796	1,299,405	1,224,943	1,214,195
May	1,570,262	1,397,579	1,411,528	1,491,641	1,550,700	1,401,169
Jun	1,638,895	1,580,785	1,619,810	1,730,134	1,654,867	1,589,082
Jul	1,925,108	1,929,044	1,916,517	1,742,842	1,841,624	1,858,099
Aug	1,941,630	1,759,113	1,727,171	1,917,821	1,844,735	1,706,095
Sep	1,674,817	1,528,155	1,447,964	1,498,795	1,549,217	1,542,294
Oct	1,364,541	1,298,198	1,291,425	1,383,546	1,397,131	1,380,879
Nov	1,228,627	1,209,765	1,230,514	1,168,818	1,313,680	1,172,846
Dec	1,266,565	1,234,822	1,281,559	1,204,030	1,301,596	1,132,696
<b>Totals</b>	<b>17,603,400</b>	<b>16,909,543</b>	<b>16,693,962</b>	<b>17,167,955</b>	<b>17,323,069</b>	<b>16,559,722</b>

## Water

In 2015 Comsatec started collecting water usage data for CHEO. Refer to Appendix C for the break down of the consumption per building. Table 7 below gives the total water consumption for CHEO.

**TABLE 7: CHEO WATER CONSUMPTION (CUBIC METERS)**

	2018	2019	2020	2021	2022	2023
Jan	3,354	2,963	7,163	6,491	6,943	7,914
Feb	3,035	6,871	7,493	6,842	7,069	8,232
Mar	3,252	7,128	7,000	6,790	6,605	8,122
Apr	3,154	7,354	5,688	7,543	11,191	10,079
May	4,329	8,311	6,675	8,306	10,427	9,804
Jun	5,753	10,507	9,292	10,676	10,931	12,470
Jul	7,611	13,027	12,014	12,640	12,037	13,088
Aug	8,041	13,413	14,488	12,416	13,895	11,976
Sep	5,177	11,726	12,573	13,532	13,356	11,159
Oct	6,743	9,534	11,523	10,629	10,918	8,856
Nov	3,425	8,584	8,770	9,906	18,477	9,455
Dec	2,823	7,928	7,428	8,086	7,845	9,958
<b>Totals</b>	<b>56,697</b>	<b>107,346</b>	<b>110,107</b>	<b>113,857</b>	<b>129,694</b>	<b>121,113</b>

Note\*: Our main incoming water meter was found to be defective in early 2019. Therefore, take note that the water consumption numbers for 2018 are inaccurate and should have been in the range of 86,000 m3 based on the water consumption levels of 2016 and 2017.

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 <sup>2</sup>
	Total MJ/YR	MJ/ft <sup>2</sup>	Total KWh/YR	eMJ/YR	MJ/ft <sup>2</sup>		
2018	85,400,000	130.1	17,603,400	63,372,241	96.54	148,772,241	226.6
2019	82,795,000	126.1	16,909,543	60,874,354	92.73	143,669,354	218.9
2020	75,940,000	115.7	16,693,962	60,098,264	91.55	136,038,264	207.2
2021	66,805,000	101.8	17,167,955	61,804,637	94.15	128,609,637	195.9
2022	75,816,740	115.5	17,323,069	62,363,049	95.00	138,179,789	210.5
2023	75,575,640	115.1	16,559,722	59,615,000	90.81	135,190,640	205.9
<p>Where the total square footage used in this table are:</p> <p>2012 to 2016 = 612,830 ft<sup>2</sup> CHEO</p> <p>2016 to 2017 = 646,788 ft<sup>2</sup> CHEO + CTC</p> <p>2017 to 2023 = 656,451 ft<sup>2</sup> CHEO + CTC + CTC Annex</p> <p>Converting factor used:</p> <p>1 MJ = 0.277777778 KWh</p>							

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 50 year old facility and over 2/3rds (~400,000 ft<sup>2</sup>) 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 2019 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 detect values that fall within +/- 10% tolerance value, and incorporate a notification system to alarm stakeholders including CHEO.

### *Identifying Potential Conservation Opportunities*

Identifying conservation opportunities continues to be a continuous performance improvement objective. CHEO has an active 'Green Team' drawn from all departments of the hospital which meet regularly to develop ideas and actions for reducing the environmental impact of the hospital and acting in a more sustainable manner.

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*

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)

- Replacement of a high energy use 1997 Magnetic Resonance Imaging (MRI) diagnostic machine which has an anticipated electrical energy saving of 10-15%
- 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.
- 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, University of Ottawa and Ottawa Children's Treatment Centre).
- 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.
- Parking and street lighting retrofit from HID to Smart LED.
- Variable Frequency Drives in all Main CHEO and OR AHU fans
- Elevator Replacement program
- Replacing all elevators with open source systems
- Air Handler Upgrades
- Replacing Catheterization Laboratory and Interventional Suite
- Conducting annual steam trap survey

### *Planned Projects over the next few years*

As a part of the Deep Energy Retrofit program, all systems throughout the hospital buildings will be subjected to evaluations, which eventually lead to the re-engineering and optimization of the system. Facilities primary initiatives for short term (less than a 1year), medium terms (1-2years) and long term (2-5 years) planning include the following:

#### **Interim**

1. Avoid simultaneous heating and cooling, summer SAT reset from 14C to 16C
  - Reset supply air temperature at the air handling unit (AHU) from 14C to 16C and the AHU will be composed of a new control sequence base on Enthalpy.
2. Shut down all steam humidification system during the summer period (mid-April to mid-Oct)
  - During the spring, summer and fall all the humidification system will be offline. This means the steam header inside the air handling units will not contribute unwanted heat.

3. Global adjustment and Demand response initiatives (5 peaks load shedding coincidently with IESO) load shedding 500KW reduction for one hour.
  - The CHEO campus will coincidently reduce demand (power) during the 5 Ontario demand peaks.
4. Control sequence optimization; Heating system, cooling system, AHU system, chillers COP.
  - Continuous dialogue/implementation with Instrumentation dept to refine and develop innovative control sequence strategy.
5. Medical Air System and Dryer replacement
  - Triplex system replaced with newer technology.
6. Cooling tower DCW evaporation grant
  - Pursue City of Ottawa wastewater exemption for the evaporation for cooling tower water.

### **Medium terms (1-5years)**

1. Replacement of 5 walk-in coolers switch to Mechanical Cooling instead of city water to drain.
2. Variable frequency drives in pumps and cooling towers
  - All pumps, cooling towers will be upgraded with the latest innovative technology with variable speed drive, controls, and remote monitoring. This will allow for more precise control and increase energy saving and reduce maintenance (wear and tears) and allow for predictive maintenance.
3. New Metering infrastructure, DCW, DHW, circuit metering for electricity of major equipment, Htg and clg meters on each building.
  - Install revenue grade digital meters, circuit metering, magflow, turbine, wireless/hardwire electricity meter etc. for measuring and verification purposes. Allowing for future programs such as social engagement between dept to achieve energy target and positive feedback.
4. Primary and secondary Corridors, stairwell lighting and all mechanical rooms upgrade to smart LED.
  - T8 re-lamping to LED will be gradually implemented improving the quality of lighting and maintenance and energy reduction at CHEO.
5. Installation of more efficient water fixtures and low flush touchless fixtures for office space and nonclinical areas
6. Pilot a Smart Intelligent Building Auditor (SIBA), Lighting and building automation system integration, Kitchen lighting retrofit.
7. Re-engineering of Main CHEO Penthouse HVAC systems

### Long term

1. Re-engineering of OR Penthouse, Garry Cardiff, and Max Keeping HVAC systems
2. The HVAC system, chilled water system, heating water system will be re-engineered to include bypass air from return to supply air where standards permit, a UV light in supply air, and new Direct Digital Control variable air volume boxes complete with low temperature heating coils in place of the constant air volume boxes. Additionally, the air diffusers will be re-balanced and re-commissioned to insure occupant comfort. The new system will be reprogrammed with a control sequence to avoid simultaneous heating and cooling.
3. Cont'd Installation of more efficient water fixtures and low flush touchless fixtures in office space and nonclinical area
4. Replacement of rooftop units with integrated heat pumps
5. Addition of energy recovery systems wherever beneficial
6. Business continuity plan and address point of failure (Electrical Vista switch and electric steam boiler)
7. Address deferred maintenance such as cooling towers, chillers, pumps, AHUs and other MNE infrastructure for the next 20 yrs.
8. System control optimization and re-commissioning of the entire buildings.
9. Solar PV installation on current buildings "Electrify the Existing."
10. Solar PV installation on new buildings "Sunny Futures"
11. Installation of moderately sized battery backup
12. Ice Bank Installation for Operating Room cooling, etc.
13. HVAC Greening, electric boiler installation

### *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.

As a result of our Global adjustment initiative and our commitment to address increasing cost of utility and energy waste, we are committed as an organization to minimize our electrical peak when it coincides with Ontario's provincial electrical peak. This program will allow CHEO to generate significant electrical cost savings. We are currently monitoring the Ontario Electricity peak and executing demand peak reductions accordingly, without impacting comfort or use of space.

The top 5 peaks of Ontario, over the year determine our electrical rate and therefore bills. When we help Ontario reduce their peak, we also reduce our share of the cost to Ontario, hence share in the electrical cost savings for Ontario through this effort. This year's (2024) target is a 500kW reduction, for a duration of one-hour, coincident with Ontario's 5 peaks.

## E. Forecast

### CHEO, Facilities and Planning

Table 3.2 : Actual-Energy Consumption and Costs, CO2 EMISSIONS RESULT ACHIEVED

	DATA ENTRY											FORMULAS														
	BASE YEAR											PROJECTION														
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
<b>Total floor area [m2]</b>	61,008	61,008	61,008	61,008	61,008	61,008	61,008	61,008	94,508	94,508	114,954	114,954	114,954	61,008	61,008	61,008	61,008	61,008	61,008	61,008	94,508	94,508	114,954	114,954	114,954	
<b>Total Energy Consumption [GJ]</b>	183,105	176,916	166,617	159,509	168,737	165,641	158,019	128,144	130,077	137,230	163,378	168,517	173,656	183,105	176,916	166,617	159,509	168,737	165,641	158,019	128,144	130,077	137,230	163,378	168,517	173,656
<b>Total GHG Emission [tonnes CO2 eq]</b>	6,742	6,530	6,038	5,610	6,053	6,006	5,649	3,930	3,390	3,680	4,787	4,834	4,881	6,742	6,530	6,038	5,610	6,053	6,006	5,649	3,930	3,390	3,680	4,787	4,834	4,881
<b>2. "Scope 2" Emissions</b>																										
<b>[Indirect emissions created on behalf of the entity]</b>																										
<b>Utilities</b>																										
<b>3.1 Electricity</b>																										
Electricity Consumption [kWh]	17,603,400	16,909,543	16,693,962	17,167,955	17,323,069	16,559,722	16,359,722	17,859,722	22,359,722	22,859,722	24,359,722	25,859,722	27,359,722	17,603,400	16,909,543	16,693,962	17,167,955	17,323,069	16,559,722	16,359,722	17,859,722	22,359,722	22,859,722	24,359,722	25,859,722	27,359,722
Electricity Consumption [GJ]	63,372	60,474	60,098	61,805	62,363	59,615	58,895	64,295	80,495	82,295	87,695	93,095	98,495	63,372	60,474	60,098	61,805	62,363	59,615	58,895	64,295	80,495	82,295	87,695	93,095	98,495
GHG Emissions	704	676	668	687	693	662	654	714	894	914	974	1,034	1,094	704	676	668	687	693	662	654	714	894	914	974	1,034	1,094
<b>Total CO2 eq [tonnes]</b>																										
<b>3.2 Domestic Water-Associated Consumption</b>																										
Water Consumption [m3]	56,697	107,346	110,107	113,857	129,694	121,113	117,480	113,955	110,537	107,220	104,004	100,884	97,857	56,697	107,346	110,107	113,857	129,694	121,113	117,480	113,955	110,537	107,220	104,004	100,884	97,857
Electricity Consumption (City of Ottawa) [kWh]	30,664	20,127	39,288	40,419	48,041	42,995	41,795	40,454	39,240	38,063	36,921	35,814	34,739	30,664	20,127	39,288	40,419	48,041	42,995	41,795	40,454	39,240	38,063	36,921	35,814	34,739
Diesel Consumption (City of Ottawa) [L]	371	244	478	490	558	521	505	490	475	461	447	434	421	371	244	478	490	558	521	505	490	475	461	447	434	421
Electricity/Diesel Consumption [GJ]	125	82	160	164	187	175	170	165	160	155	150	146	141	125	82	160	164	187	175	170	165	160	155	150	146	141
GHG Emissions	2	1	3	1	2	1	1	1	1	1	1	1	1	2	1	3	1	2	1	1	1	1	1	1	1	1
<b>Total CO2 eq [tonnes]</b>																										
<b>3.3 Miscellaneous Source: Steam from Natural Gas</b>																										
Steam Consumption [GJ]	26,628	24,889	22,173	17,749	18,244	18,308	17,393	17,210	17,026	16,843	16,660	16,477	16,294	26,628	24,889	22,173	17,749	18,244	18,308	17,393	17,210	17,026	16,843	16,660	16,477	16,294
MTHW Consumption [GJ]	58,772	57,906	53,767	49,056	57,573	57,270	53,261	28,261	18,261	22,270	37,270	37,270	37,270	58,772	57,906	53,767	49,056	57,573	57,270	53,261	28,261	18,261	22,270	37,270	37,270	37,270
Total Steam & MTHW Consumption [GJ]	85,400	82,795	75,940	66,805	75,817	75,578	70,654	45,471	35,287	39,113	53,950	53,747	53,564	85,400	82,795	75,940	66,805	75,817	75,578	70,654	45,471	35,287	39,113	53,950	53,747	53,564
Natural Gas Required Energy Consumption [m3]	3,173,464	3,076,662	2,821,930	2,587,949	2,817,359	2,803,478	2,625,491	1,680,688	1,311,285	1,453,452	2,004,049	1,997,246	1,990,442	3,173,464	3,076,662	2,821,930	2,587,949	2,817,359	2,803,478	2,625,491	1,680,688	1,311,285	1,453,452	2,004,049	1,997,246	1,990,442
Equivalent Energy Consumption [GJ]	119,808	115,959	106,359	97,540	106,196	105,852	98,955	63,684	49,422	54,761	75,533	75,276	75,020	119,808	115,959	106,359	97,540	106,196	105,852	98,955	63,684	49,422	54,761	75,533	75,276	75,020
GHG Emissions	6,001	5,818	5,336	4,894	5,328	5,311	4,965	3,195	2,480	2,748	3,790	3,777	3,764	6,001	5,818	5,336	4,894	5,328	5,311	4,965	3,195	2,480	2,748	3,790	3,777	3,764
CH4 [tonnes CO2 eq]	2.47	2.39	2.19	2.01	2.19	2.18	2.04	1.31	1.02	1.13	1.56	1.55	1.55	2.47	2.39	2.19	2.01	2.19	2.18	2.04	1.31	1.02	1.13	1.56	1.55	1.55
N2O [tonnes CO2 eq]	32.46	31.47	28.87	26.47	28.82	28.73	26.86	17.29	13.41	14.87	20.50	20.43	20.36	32.46	31.47	28.87	26.47	28.82	28.73	26.86	17.29	13.41	14.87	20.50	20.43	20.36
<b>Total CO2 eq [tonnes]</b>	6,036	5,852	5,367	4,922	5,359	5,342	4,994	3,214	2,494	2,764	3,812	3,799	3,786	6,036	5,852	5,367	4,922	5,359	5,342	4,994	3,214	2,494	2,764	3,812	3,799	3,786
<b>Indirect Emissions TOTAL</b>																										
Equivalent Energy Consumption [GJ]	183,105	176,916	166,617	159,509	168,737	165,641	158,019	128,144	130,077	137,230	163,378	168,517	173,656	183,105	176,916	166,617	159,509	168,737	165,641	158,019	128,144	130,077	137,230	163,378	168,517	173,656
GHG Emissions	6,742	6,530	6,038	5,610	6,053	6,006	5,649	3,930	3,390	3,680	4,787	4,834	4,881	6,742	6,530	6,038	5,610	6,053	6,006	5,649	3,930	3,390	3,680	4,787	4,834	4,881

Prepared by: Faizal Sudooallah, P. Eng  
28-Jun-24

## APPENDIX A

Below is the thermal energy consumption data on a monthly basis for the periods 2012 to 2023, as well as Graphic A for illustration.

### CHEO Hot Water (GJ)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
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	<b>58,772</b>
2019	9,299	7,256	5,611	3,895	3,579	3,432	3,186	3,562	3,615	3,418	5,115	5,938	<b>57,906</b>
2020	6,577	6,652	6,141	4,000	4,720	3,378	2,936	3,070	3,400	3,893	3,687	5,340	<b>53,767</b>
2021	6,182	5,959	4,599	3,716	3,528	2,962	2,996	2,634	2,824	3,562	4,453	5,641	<b>49,056</b>
2022	9,999	7,739	5,574	4,906	3,942	3,466	3,382	3,400	3,515	3,676	4,218	3,755	<b>57,572</b>
2023	5,904	6,364	4,854	4,113	4,173	3,811	3,878	4,449	4,047	4,616	5,155	5,906	<b>57,270</b>

### CHEO Steam (GJ)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2018	2,544	2,416	2,882	2,415	1,621	1,468	1,511	1,513	790	1,680	2,185	2,904	<b>23,929</b>
2019	3,016	2,754	2,820	2,037	1,593	1,385	1,352	1,137	831	1,503	1,721	2,497	<b>22,646</b>
2020	3,072	2,542	2,415	2,425	2,021	681	685	653	640	1,060	1,690	2,245	<b>20,129</b>
2021	2,225	2,124	2,251	1,358	700	668	835	736	760	744	747	1,705	<b>14,853</b>
2022	2,242	2,162	2,199	1,994	927	550	611	589	566	601	808	2,346	<b>15,595</b>
2023	2,468	2,423	2,731	1,511	809	748	581	600	585	541	917	1,734	<b>15,648</b>

### Total CHEO (GJ)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
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	<b>82,701</b>
2019	12,315	10,010	8,431	5,932	5,172	4,817	4,538	4,699	4,446	4,921	6,836	8,435	<b>80,552</b>
2020	9,649	9,194	8,556	6,425	6,741	4,059	3,621	3,723	4,040	4,953	5,377	7,585	<b>73,896</b>
2021	8,407	8,083	6,850	5,074	4,228	3,630	3,831	3,370	3,584	4,306	5,200	7,346	<b>63,909</b>
2022	12,241	9,901	7,773	6,900	4,869	4,016	3,993	3,989	4,081	4,277	5,026	6,101	<b>73,167</b>
2023	8,372	8,787	7,585	5,623	4,559	4,459	5,049	4,632	5,157	6,072	7,640	9,662	<b>82,579</b>



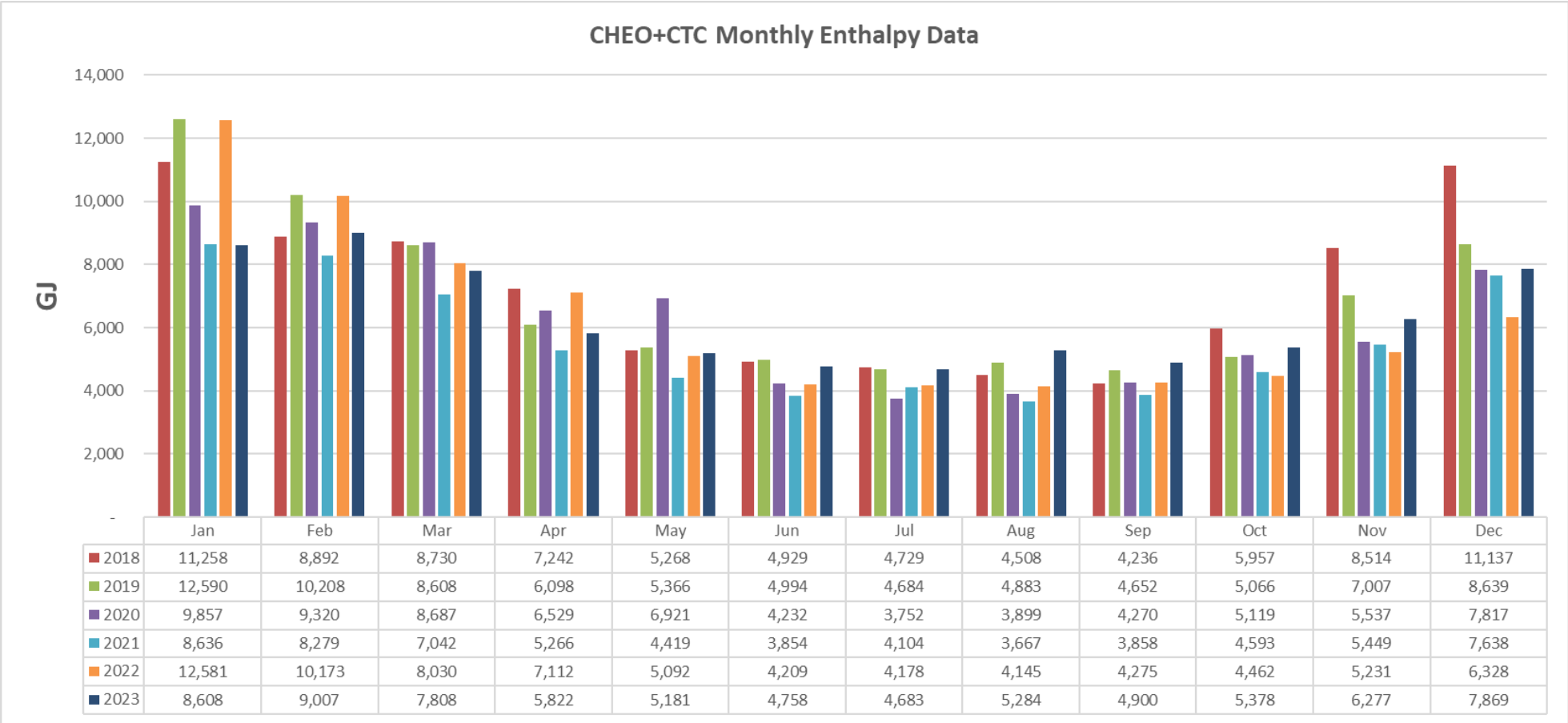
**CTC  
Steam**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2018	406	338	354	318	174	166	163	9	244	130	168	229	<b>2,699</b>
2019	275	198	177	166	194	177	146	184	206	145	171	204	<b>2,243</b>
2020	208	153	131	104	180	173	131	176	230	166	160	232	<b>2,044</b>
2021	229	196	192	192	191	224	273	297	274	287	249	292	<b>2,896</b>
2022	340	272	257	212	223	193	185	156	194	185	205	227	<b>2,649</b>
2023	236	220	223	199	199	199	224	235	268	221	204	229	<b>2,658</b>

**Total Enthalpy CHEO + CTC**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
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	<b>85,400</b>
2019	12,590	10,208	8,608	6,098	5,366	4,994	4,684	4,883	4,652	5,066	7,007	8,639	<b>82,795</b>
2020	9,857	9,320	8,687	6,529	6,921	4,232	3,752	3,899	4,270	5,119	5,537	7,817	<b>75,940</b>
2021	8,636	8,279	7,042	5,266	4,419	3,854	4,104	3,667	3,858	4,593	5,449	7,638	<b>66,805</b>
2022	12,581	10,173	8,030	7,112	5,092	4,209	4,178	4,145	4,275	4,462	5,231	6,328	<b>75,817</b>
2023	8,608	9,007	7,808	5,822	5,181	4,758	4,683	5,284	4,900	5,378	6,277	7,869	<b>75,576</b>

**GRAPHIC A: CHEO + CTC MONTHLY ENTHALPY DATA**



## APPENDIX B

Below is the electricity consumption data for CHEO and CTC for the period 2012 to 2023. Graphic B illustrates the totals consumption for CHEO+CTC.

### CHEO kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
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	<b>17,142,846</b>
2019	1,265,178	1,126,393	1,222,020	1,196,466	1,361,826	1,545,671	1,890,934	1,722,939	1,492,431	1,258,984	1,169,903	1,194,683	<b>16,447,427</b>
2020	1,217,058	1,134,430	1,169,114	1,092,521	1,375,965	1,584,449	1,880,987	1,693,945	1,415,780	1,256,446	1,195,684	1,244,502	<b>16,260,880</b>
2021	1,245,296	1,128,506	1,246,948	1,266,621	1,458,258	1,696,742	1,710,033	1,884,004	1,466,423	1,351,040	1,135,134	1,168,503	<b>16,757,507</b>
2022	1,204,758	1,094,884	1,179,450	1,139,337	1,450,870	1,550,250	1,729,127	1,731,850	1,449,834	1,304,225	1,224,523	1,208,377	<b>16,267,485</b>
2023	1,197,449	1,093,977	1,195,733	1,192,903	1,379,210	1,570,890	1,841,064	1,687,784	1,522,986	1,358,519	1,149,300	1,108,938	<b>16,298,753</b>

### CTC kWh

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
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	<b>352,086</b>
2019	36,454	32,325	33,599	29,824	27,309	25,532	26,387	25,492	26,471	31,408	32,609	32,732	<b>360,142</b>
2020	34,230	31,810	32,209	27,502	27,031	25,538	23,869	22,723	23,406	27,189	27,417	29,341	<b>332,265</b>
2021	30,220	29,511	31,976	26,325	25,946	24,739	24,088	24,209	24,893	25,616	27,896	29,567	<b>324,984</b>
2022	32,517	29,730	31,358	27,500	25,835	25,554	24,311	24,561	25,442	26,391	26,706	31,592	<b>331,496</b>
2023	31,598	29,160	31,717	27,198	28,787	25,970	25,664	26,667	26,849	29,085	29,237	29,248	<b>341,178</b>

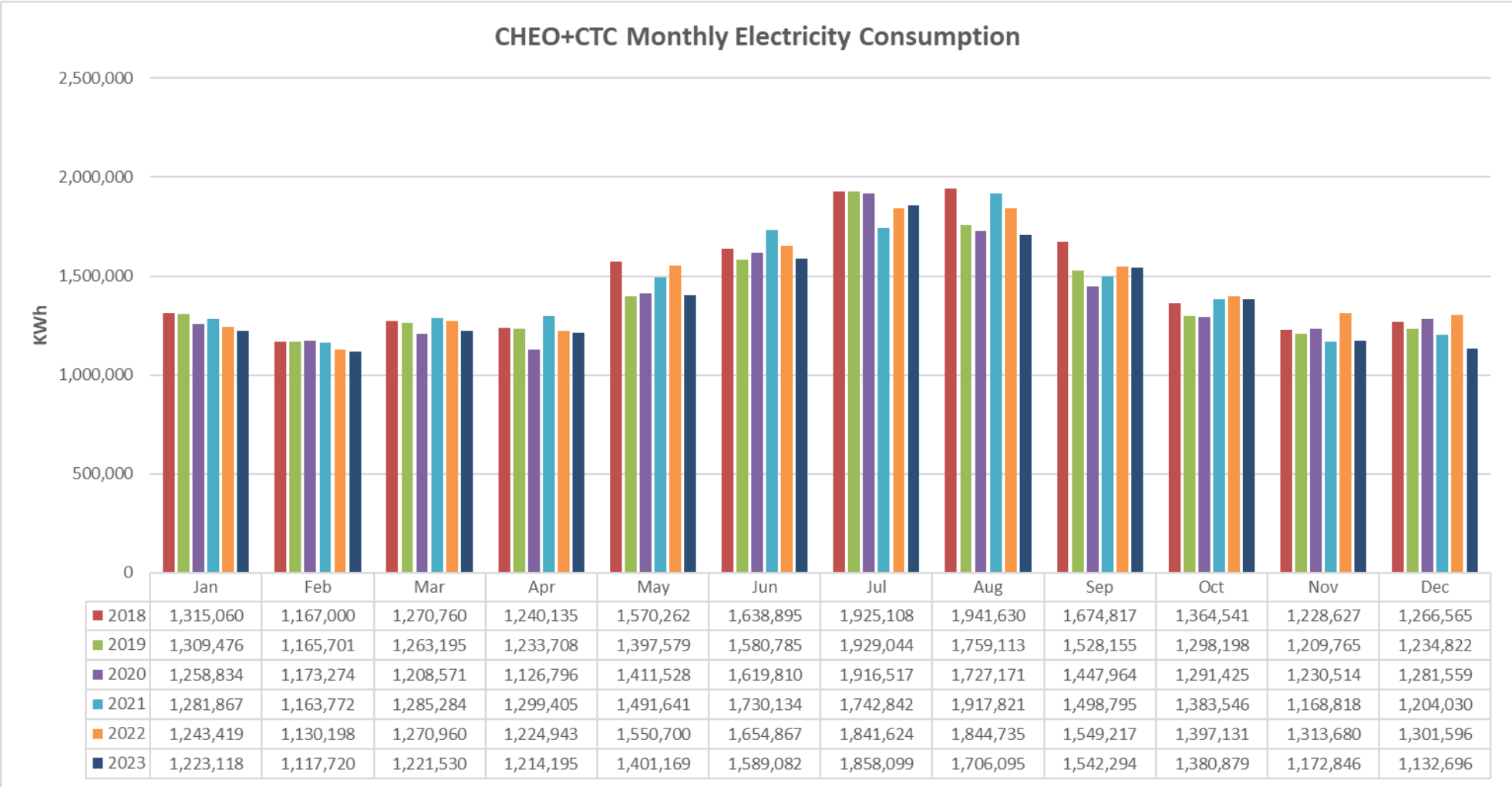
### CHEO kW

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	2,010.00	2,031.00	1,967.00	2,385.00	3,184.00	3,275.00	3,364.00	3,357.00	3,345.00	3,159.00	1,967.00	1,982.00
2019	2,006.00	1,992.00	2,010.00	2,302.00	2,556.00	3,066.00	3,252.00	3,042.00	3,046.00	2,250.00	1,948.00	1,952.00
2020	1,938.00	1,930.00	1,890.00	1,994.00	2,718.00	2,932.00	3,008.00	2,934.00	2,896.00	2,474.00	1,866.00	1,814.00
2021	1,810.00	1,808.00	1,828.00	2,340.00	2,800.00	3,152.00	2,946.00	2,948.00	2,820.00	2,510.00	1,732.00	1,722.00
2022	1,764.00	1,730.00	1,730.00	2,214.00	2,576.00	3,008.00	2,914.00	2,928.00	2,634.00	2,516.00	2,256.00	1,748.00
2023	1765.39	1892.00	1905.65	2560.36	2688.66	3174.40	3230.94	2897.30	3266.67	2945.27	1841.47	1766.59

### CTC kW

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	63.00	58.00	55.00	52.00	53.00	52.00	53.00	53.00	53.00	48.00	54.00	59.00
2019	65.43	63.30	58.01	46.00	43.65	45.8	43.93	43.21	46.21	43.48	55.09	60.08
2020	58.36	62.39	58.73	37.88	38.75	37.56	34.59	33.89	36.02	39.98	43.45	51.82
2021	50.49	53.27	47.77	44.57	44.13	42.64	37.15	38.15	43.67	40.77	44.53	51.36
2022	55.14	54.93	52.31	43.15	45.66	42.92	37.96	41.11	43.28	43.48	41.21	51.57
2023	53.87	53.20	55.41	43.44	43.06	44.76	41.88	39.31	44.57	45.28	45.67	51.21

**GRAPHIC B: CHEO + CTC MONTHLY CONSUMPTION (KWH)**



## APPENDIX C

Below is the water usage data for all of CHEO buildings (or accounts).

Account Name	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
<b>CHEO 1</b>	<b>2018</b>	1,524	1,346	1,500	1,398	1,972	2,496	3,933	4,586	2,725	2,931	1,688	1,338	<b>27,437</b>
	<b>2019</b>	1,265	1,319	1,457	1,560	2,221	4,133	6,096	5,906	5,055	3,526	2,983	2,184	<b>37,705</b>
	<b>2020</b>	1,740	1,938	1,616	850	1,379	3,189	5,462	7,569	6,463	5,911	3,457	2,586	<b>42,160</b>
	<b>2021</b>	1,454	1,690	1,587	1,978	2,562	3,863	5,247	5,680	5,807	4,713	3,027	2,340	<b>39,912</b>
	<b>2022</b>	957	1,442	1,096	7,668	7,668	7,820	8,922	10,413	9,720	8,051	13,555	5,782	<b>83,094</b>
	<b>2023</b>	5,979	6,243	6,246	8,022	7,410	9,300	9,452	8,692	8,076	6,656	6,374	5,860	<b>88,310</b>
<b>Research I</b>	<b>2018</b>	120	142	144	131	154	129	122	131	85	162	136	110	<b>1,566</b>
	<b>2019</b>	119	125	122	122	128	126	116	107	126	114	129	101	<b>1,435</b>
	<b>2020</b>	98	119	88	34	40	49	57	52	57	80	70	98	<b>842</b>
	<b>2021</b>	54	60	57	64	173	270	355	358	1,449	142	1,351	725	<b>5,058</b>
	<b>2022</b>	612	571	722	760	791	1,035	1,267	1,434	1,570	1,335	1,995	724	<b>12,816</b>
	<b>2023</b>	694	690	672	823	947	1,210	1,503	1,361	1,346	986	1,851	2,942	<b>15,025</b>
<b>CHEO 2</b>	<b>2018</b>	402	361	395	382	442	544	386	428	389	973	397	315	<b>5,414</b>
	<b>2019</b>	338	293	363	498	530	657	985	1,105	971	782	600	534	<b>7,656</b>
	<b>2020</b>	445	430	429	456	533	767	1,068	1,216	1,004	791	639	531	<b>8,309</b>
	<b>2021</b>	449	445	457	492	546	723	1,010	699	694	646	610	590	<b>7,361</b>
	<b>2022</b>	584	1,208	-	1,465	616	616							<b>4,489</b>
	<b>2023</b>													
<b>Max Keeping Wing</b>	<b>2018</b>	207	199	213	214	238	256	469	450	306	472	246	208	<b>3,478</b>
	<b>2019</b>	221	227	256	257	250	240	212	200	240	240	252	206	<b>2,801</b>
	<b>2020</b>	194	238	225	99	110	133	126	114	135	145	149	146	<b>1,814</b>
	<b>2021</b>	125	158	147	158	198	359	290	224	210	187	193	196	<b>2,445</b>

	<b>2022</b>	201	206	215	215	241	162	230	201	206	194	337	120	<b>2,528</b>
	<b>2023</b>	174	162	149	178	175	231	213	227	267	188	185	147	<b>2,296</b>
<b>Research II</b>	<b>2018</b>	111	107	114	108	192	367	474	414	269	377	126	98	<b>2,757</b>
	<b>2019</b>	97	101	156	134	143	168	502	646	527	328	205	205	<b>3,212</b>
	<b>2020</b>	215	197	195	147	168	209	279	334	291	232	213	196	<b>2,676</b>
	<b>2021</b>	181	193	184	189	220	250	304	316	294	141	197	183	<b>2,652</b>
	<b>2022</b>	142	171	184	177	186	195	259	306	301	293	520	196	<b>2,930</b>
	<b>2023</b>	211	214	193	186	194	223	230	219	353	208	206	182	<b>2,619</b>
<b>Garry Cardiff Wing</b>	<b>2018</b>	990	880	886	921	1,331	1,961	2,227	2,032	1,403	1,828	832	754	<b>16,045</b>
	<b>2019</b>	923	1,010	1,004	899	1,042	1,542	1,753	2,133	1,482	1,014	886	1,120	<b>14,808</b>
	<b>2020</b>	901	974	889	706	852	1,220	1,386	1,659	1,030	766	678	271	<b>11,332</b>
	<b>2021</b>	810	819	897	1,106	998	1,614	1,723	1,536	1,420	1,207	996	1,115	<b>14,241</b>
	<b>2022</b>	888	881	838	906	925	1,103	1,359	1,541	1,559	1,045	2,070	1,023	<b>14,138</b>
	<b>2023</b>	856	923	862	870	1,078	1,506	1,690	1,477	1,117	818	839	827	<b>12,863</b>

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Total

<b>Total Water (m3)</b>	<b>2018</b>	3,354	3,035	3,252	3,154	4,329	5,753	7,611	8,041	5,177	6,743	3,425	2,823	<b>56,697</b>
	<b>2019</b>	2,963	6,871	7,128	7,354	8,311	10,507	13,027	13,413	11,726	9,534	8,584	7,928	<b>107,346</b>
	<b>2020</b>	7,163	7,493	7,000	5,688	6,675	9,292	12,014	14,488	12,573	11,523	8,770	7,428	<b>110,107</b>
	<b>2021</b>	6,491	6,842	6,790	7,543	8,306	10,676	12,640	12,416	13,532	10,629	9,906	8,086	<b>113,857</b>
	<b>2022</b>	6,943	7,069	6,605	11,191	10,427	10,931	12,037	13,895	13,356	10,918	18,477	7,845	<b>129,694</b>
	<b>2023</b>	7,914	8,232	8,122	10,079	9,804	12,470	13,088	11,976	11,159	8,856	9,455	9,958	<b>121,113</b>