EXHIBIT 3 – LOAD AND CUSTOMER FORECAST

2023 Cost of Service

Cooperative Hydro Embrun Inc.
EB-2022-0022

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3.1 LOAD AND CUSTOMER FORECAST

3.1.1 Introduction

This exhibit describes the proposed load forecast methodology and assumptions used to determine the rates and rate riders for CHEI's customer classes.

CHEI notes that it is not proposing any changes to the below customer class composition

Table 1 – Customer Class Composition and billing determinants

Customer Class Name	Existing/ Proposed	MSC Metric	Usage Metric
Residential	Existng	Customer	kWh
GS < 50 kW	Existing	Customer	kWh
GS > 50 to 4999 kW	Existing	Customer	kW
Unmetered Scattered Load	Existing	Customer	kWh
Street Lighting	Existing	Connection	kW

To facilitate the understanding of the load forecast, CHEI has completed the table below summarizing characteristics unique to the service area of Cooperative Hydro Embrun.

Table 2 – Identifiers Unique to the LDC

	Factor	Unique to LDC
1	Customer growth or decline (historical or future)– residential	No
2	Customer growth or decline (historical or future)– business	No
3	Increased / Reduced kW Demand (historic or future)	No
4	Weather abnormality	No
5	Infrastructure growth / decline	No
6	Change in Demographics	No
7	Customer composite (e.g. 85% residential accounts making up 50% of annual kWh consumption)	No
8	Growth in net-metered accounts, electric vehicles, battery-storage	No
9	Growth in energy conservation	No
10	Etc	No

The utility doesn't believe there are any specific factors that would be unique to them or would have caused a significant change in how it determines its load forecast compared to the last board-approved cost of service. The growth rate is slow yet consistent as it has been in past years. There have been ongoing discussions of new subdivisions in the distribution service area; however, nothing has yet been confirmed. The utility is not projecting any growth other than what it has seen over past years and found the regression results to be in line with its internal prediction of customer and connection projections. As indicated in the DSP, the utility maintains regular contact with developers and the region and is generally informed well in advance of upcoming plans for subdivisions and new development. The utility met with developers on December 7, 2021, and to date, no plans are firm enough to include in the load and customer forecast.

Embrun continues to be a bedroom community for Ottawa, and as such, the demographics and customer class composition are not expected to change going forward. Much like the rest of the province, Embrun has seen some weather abnormalities in its service area but nothing significant enough to warrant changes in its capital spending or load projections. CHEI's distribution system is in excellent condition and robust enough to withstand sporadic weather abnormalities. CHEI has not encouraged any CDM activities since the province mandated that programs be put on hold in April 2019. CHEI still has several active MicroFit connections but doesn't anticipate any new connections in the near future.

3.1.2 Proposed Methodology

CHEI's load forecast methodology has not changed since its last Cost of Service in 2018. The forecast is prepared in two phases. The first phase, a billed energy forecast by customer class for 2023, is developed using a total purchase (Wholesale) basis regression analysis. The methodology proposed in this application predicts wholesale consumption (Predicted) using a multiple regression analysis that relates historical monthly wholesale kWh usage to carefully selected variables. The one-way analysis of variance (ANOVA) is used to determine any statistically significant differences between the means of three or more independent (unrelated) groups. The ANOVA compares the means between the groups you are interested in and determines whether any means are statistically significantly different. The utility did not test the NAC method because NAC is generally seen as an alternative when sound historical data is not available.

The most significant variables used in weather-related regressions are monthly historical heating degree days and cooling degree days. Heating degree-days provide a measure of how much (in degrees), and for how long (in days), the outside temperature was below that base temperature. The most readily available heating degree days come with a base temperature of 18°C. Cooling degree-day figures also come with a base temperature and measure how much, and for how long, the outside temperature was above that base temperature.

For degree days, daily observations as reported in Ottawa are used. The regression model also uses other variables which are tested to see their relationship and contribution to the fluctuating wholesale purchases. Each variable is discussed in detail later in this section.

3.1.3 Historical Forecast vs. Actual

CHEI purchases electricity from Hydro One and embedded generation (MicroFIT). The following table summarizes the annual wholesale purchases for the ten years 2012 to October 2021 as reported to OEB in RRR annual filing "2.1.5 Supply & Delivery Information". November and December of 2021 are estimated.

3.1.3.1 Overview of Wholesale Purchases

CHEI purchases electricity from Hydro One and embedded generation (MicroFit).

Table 3 – Historical Monthly Wholesale (2012-2017)

	2012	2013	2014	2015	2016	2017
January	3,202,608	3,169,441	3,341,962	3,343,788	2,943,832	2,836,432
February	2,731,076	2,777,911	2,828,607	3,098,884	2,768,809	2,473,666
March	2,525,873	2,611,711	2,897,553	2,737,094	2,534,657	2,673,973
April	2,174,994	2,236,208	2,238,431	2,153,330	2,177,366	2,084,834
May	2,158,953	2,101,527	2,038,742	2,103,059	2,121,246	2,042,459
June	2,415,361	2,228,338	2,320,389	2,151,361	2,308,818	2,235,138
July	2,724,298	2,694,719	2,428,244	2,552,634	2,626,216	2,360,675
August	2,625,289	2,471,504	2,393,429	2,503,006	2,774,979	2,512,536
September	2,170,214	2,100,221	2,172,266	2,323,301	2,187,612	2,295,953
October	1,955,014	2,152,524	2,119,536	2,085,076	2,118,130	2,032,906
November	2,385,500	2,533,833	2,437,271	2,278,528	2,256,191	2,550,683
December	3,022,298	3,223,413	2,941,023	2,566,412	2,854,984	3,070,425
Total	**30,091,478**	**30,301,350**	**30,157,452**	**29,896,472**	**29,672,839**	**29,169,681**

Table 4 – Historical Monthly Wholesale (2018-2023)

	2018	2019	2020	2021	2022	2023
January	3,165,726	3,145,868	2,876,194	2,929,720	**2,994,105**	**2,997,466**
February	2,566,576	2,705,301	2,648,713	2,689,098	**2,835,972**	**2,845,410**
March	2,548,260	2,648,806	2,518,406	2,651,698	**2,799,054**	**2,817,849**
April	2,252,422	2,202,910	2,179,090	2,116,456	**2,277,940**	**2,280,400**
May	2,036,801	2,012,803	2,246,165	2,261,742	**2,200,008**	**2,208,873**
June	2,270,844	2,219,087	2,502,070	2,654,052	**2,222,786**	**2,225,342**
July	2,904,904	2,969,546	3,144,590	2,643,274	**2,741,949**	**2,737,789**
August	2,795,184	2,547,383	2,656,474	3,055,729	**2,621,352**	**2,623,307**
September	2,337,172	2,074,050	2,129,182	2,221,586	**2,160,123**	**2,165,511**
October	2,218,376	2,072,932	2,228,772	2,189,898	**2,228,831**	**2,235,472**
November	2,554,038	2,540,264	2,386,318	2,425,000	**2,414,778**	**2,415,212**
December	2,919,333	2,915,569	2,895,264	2,900,000	**2,886,101**	**2,892,507**
Total	**30,569,635**	**30,054,521**	**30,411,238**	**30,738,254**	**30,383,005**	**30,445,145**

CHEI's load has been relatively consistent over the past ten years, with a drop in 2017 due to the weather, amplified by a seasonably warm 2018. As shown in the table below, the movement in peaks between 2017 to 2019 support the reasoning that the abnormal shift in load were related to unseasonal weather patterns. Table 6 shows the year-over-year variance in wholesale purchases, which highlights the stability of the load flowing into the distribution system.

Table 5 – Monthly Peak (2012-2021)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
January	6,239.00	6,570.00	6,887.63	6,633.65	5,971.95	5,821.57	6,473.67	6,358.69	5,895.45	**5,891.00**
February	5,798.00	6,126.00	5,778.12	6,204.54	6,235.96	5,590.98	5,499.23	5,804.46	5,602.63	5,686.17
March	5,273.00	5,013.00	5,711.29	5,437.25	5,310.26	5,213.55	4,805.20	5,129.47	4,955.76	5,214.67
April	4,291.00	4,366.00	4,375.30	5,159.88	4,588.41	4,331.09	**6,557.21**	4,380.85	4,183.98	4,284.07
May	5,180.00	5,598.00	4,484.81	5,199.98	5,744.71	5,036.23	5,197.30	3,992.07	**6,880.65**	5,584.00
June	6,607.00	5,685.00	5,464.00	6,162.44	6,162.00	6,088.92	5,722.57	5,527.35	6,717.69	6,955.10
July	6,152.00	6,369.64	5,774.78	6,205.89	6,056.00	5,811.54	6,858.32	6,429.00	**7,223.11**	6,395.08
August	5,925.00	5,985.00	5,734.68	6,219.25	6,446.50	5,844.17	**6,825.23**	6,124.59	6,403.36	**7,205.74**
September	5,858.00	5,049.59	5,484.04	4,421.32	5,371.58	6,516.68	**6,554.73**	4,739.86	4,640.59	4,813.48
October	4,365.00	4,722.09	4,147.28	4,451.32	4,478.13	4,079.34	4,615.00	4,337.00	4,640.59	4,346.11
November	5,624.00	**5,851.65**	5,173.24	5,230.05	5,006.15	5,371.84	5,455.38	5,361.08	5,282.50	5,543.89
December	6,309.00	6,683.78	6,022.08	5,607.89	6,025.42	6,165.12	5,520.73	6,223.85	6,135.34	
Winter peak	33,608.00	34,966.52	33,719.64	33,564.70	33,027.87	32,242.40	32,369.21	33,214.55	32,512.27	26,681.84
Summer peak	34,013.00	33,053.23	31,317.61	33,368.76	34,369.20	33,628.63	37,715.36	31,193.72	36,049.38	35,237.47
Total	67,621.00	68,019.75	65,037.25	66,933.46	67,397.07	65,871.03	70,084.57	64,408.27	68,561.65	61,919.31
Annual Avg	**5,635.08**	**5,668.31**	**5,419.77**	**5,577.79**	**5,616.42**	**5,489.25**	**5,840.38**	**5,367.36**	**5,713.47**	**5,159.94**

Table 6 – Trend in Historical Yearly Wholesale Purchases

Year	Wholesale	year over year
2012	30,091,478	
2013	30,301,350	0.70%
2014	30,157,452	-0.47%
2015	29,896,472	-0.87%
2016	29,672,839	-0.75%
2017	29,169,681	-1.70%
2018	30,569,635	4.80%
2019	30,054,521	-1.69%
2020	30,411,238	1.19%
2021	30,738,254	1.08%
2022	**30,383,005**	**-1.16%**
2023	**30,445,145**	**0.20%**

CHEI analyzed its wholesale purchases to see the effects of Covid on its monthly load. Although the utility tested various scenarios, it didn't feel confident enough in the relationship between the variance to attribute it to Covid. The regression analysis results were statistically reasonable sufficient to exclude any Covid related adjustments.

Table 7 – Covid Analysis

	2019	2020	2021	10Yr AVG	AVG vs COVID 2019	AVG vs COVID 2020	Avg vs COVID 2021
January	3,145,868	2,876,194	2,929,720	3,095,557	-50,311	(219,364)	(165,837)
February	2,705,301	2,648,713	2,689,098	2,728,864	23,563	(80,151)	(39,766)
March	2,648,806	2,518,406	2,651,698	2,634,803	-14,003	(116,397)	16,895
April	2,202,910	2,179,090	2,116,456	2,181,604	-21,306	(2,514)	(65,148)
May	2,012,803	2,246,165	2,261,742	2,112,350	99,547	133,815	149,393
June	2,219,087	2,502,070	2,654,052	2,330,546	111,459	171,524	323,506
July	2,969,546	3,144,590	2,643,274	2,704,910	-264,636	439,680	(61,636)
August	2,547,383	2,656,474	3,055,729	2,633,551	86,168	22,923	422,177
September	2,074,050	2,129,182	2,221,586	2,201,156	127,106	(71,973)	20,431
October	2,072,932	2,228,772	2,189,898	2,117,317	44,385	111,455	72,581
November	2,540,264	2,386,318	2,425,000	2,434,763	-105,501	(48,445)	(9,763)
December	2,915,569	2,895,264	2,900,000	2,930,872	15,303	(35,608)	(30,872)
Total	30,054,521	**30,411,238**	**30,738,254**	**30,106,292**	**51,774**	**304,946**	**631,962**

- Cells in dark blue represent province-wide shutdown

3.1.3.2 Overview of Variable Used

Five main factors influence CHEI's monthly electricity consumption – weather (e.g., heating (1) and cooling (2), which is by far the most dominant effect on most systems; the number of days per month (3), a spring and fall flag (4) and customer count (5). Specifics relating to each variable used in the regression analysis are presented in the next section.

Heating and Cooling:

To determine the relationship between observed weather and energy consumption, monthly weather observations describing the extent of heating or cooling required within the month are necessary. Environment Canada publishes monthly observations on heating degree days (HDD) and cooling degree days (CDD) for selected weather stations across Canada. Heating degree-days for a given day are the number of Celsius degrees that the mean temperature is below 18°C. Cooling degree-days for a given day are the number of Celsius degrees with a mean temperature above 18°C. For CHEI, the monthly HDD and CDD reported at Ottawa International Airport were used.

CHEI has adopted the ten-year average from 2012 to (Nov) 2021 as the definition of weather normal. The following table outlines the monthly weather data used in the regression analysis.

Days per month:

CHEI tested and included a "Days per month" variable. Although the variables did not yield particularly significant results, they did slightly improve the R-Square, and therefore CHEI opted to keep it as a variable.

Spring and Fall Flag:

CHEI tested and included a spring and fall flag to identify the spring and fall months. In this case, April, May, September, October, and November are set at "1". Summer and winter months are set at "0". The results without this variable drop considerably to 78.22%; therefore, the utility opted to include the variable in its regression analysis.

Customer Count:

CHEI tested and included a "Customer Count" variable. The rationale for testing this particular variable is that hypothetically, the load is expected to grow due to more customers being added to the distribution system. In CHEI's case, it did not significantly change the regression analysis results; therefore, the assumption is that some persisting conservation is netting the increase in load. Since the variable yielded "no worse" results, the utility opted to keep it.

Origin of variables

- HDD: Stats Canada
- CDD : Stats Canada
- Days per month Computed by the utility
- Customer Count Computed by the utility
- Spring Fall Flag Computed by the utility

The rationale for including and excluding variables

During the process of testing the regression analysis, many different variables and times periods are tested to arrive at the best R-Squared. The utility's rationale behind selecting or dropping certain variables involves a "no-worst" rationale. In other words, if a variable is justified and does not worsen the results, it is generally kept as one of the regression variables. In this case, the Days per Month only slightly improved the R-Square. However, the utility still opted to keep them as part of the regression analysis.

Table 8 – Results without individual variables

Customer Class Name	Proposed Adjusted R-Square	Without variable
HDD	**84.17**	
CDD	**84.17**	**72.56**
Days per Month	**84.17**	**83.71**
Spring Fall	**84.17**	**78.22**
Customer Count	**84.17**	**84.17**

3.1.3.3 Regression Results

The table below displays the R-squared for the multiple regression equation. The table also shows the equation's standard error margin and tests the analysis for statistical significance at a 95% confidence interval. In simple terms, 84.17% of the change in wholesale can be explained by the difference in 5 independent variables. The adjusted R-square of 84.17% is considerably higher than the 76.9% adjusted R-Square from its 2018 load forecast.

Table 9 – Equation Parameters

R Squared	0.8483
Adjusted R Squared	0.8417
Standard Error	137842.5000
F - Statistic	127.5170

The table below summarises the individual equation coefficient components with corresponding error margins. The sum of these error margins will differ from the overall standard error of the equation due to the offsetting effect between the components. The t Stat represents a ratio of the estimated coefficient to its standard error. The t Stat can be interpreted as a measure of predictability of the variable, with higher being better. The p-Value represents the probability that the t Stat can be outside of the extremities of the standard error. The p-Value can be interpreted as the probability that the error margin is due to chance rather than a real difference with lower being better.

Table 10 – Multiple Regression Equation

	Coefficients	Standard Error	t Stat	p-Value
Intercept	984,569.929	534,328.726	1.843	6.80%
HDD	944.266	79.040	11.947	0.00%
CDD	4,260.190	461.264	9.236	0.00%
NoD in Month	34,262.588	16,501.380	2.076	4.01%
Spring Fall	-245,858.112	36,979.092	-6.649	0.00%
Cust Count	69.038	76.117	0.907	36.63%

The table below displays a simple linear regression analysis of each independent variable against the dependent variable. The independent R-squared results help determine which independent variables should be included in the analysis.

Table 11 – Independent Analysis

	R Squared	Coefficient	Intercept
Intercept	34.12%	668.09	2269763.00
HDD	1.47%	895.18	2484152.00
CDD	0.74%	36892.93	1385775.38
NoD in Month	65.52%	-558470.51	2788093.00
Spring Fall	0.09%	60.92	2377633.25
Cust Count	34.12%	668.09	2269763.00

The Durbin-Watson statistic determines if sequential (adjacent) residuals are correlated. One of the regression analysis assumptions is that the residuals (errors) are independent of each other.

Sometimes, however, the data set may unknowingly contain an 'order effect,' meaning that a previous measurement could influence the outcome of the successive observations. If the residuals are not correlated, the Durbin-Watson statistic should be close to 2. Critical values displayed to the right of the statistic are based on the sample and the number of independent variables. Based on the position of the Durbin-Watson statistic relative to these values, the following assumptions can be made:

Table 12 – Confidence (95%)

1.114	**Durbin-Watson Statistic**
1.63 - 1.77	**Positive autocorrelation detected**
2.290	**Critical F-Statistic - 95% Confidence**
89.62%	**Confidence to which analysis holds**

Once CHEI calculated its preferred Regression Results, the Load Forecast model then uses the coefficients from the regression results to adjust the wholesale purchases. Table 7, as seen below, demonstrates the results of this adjustment. The table shows a comparison of the actual and predicted wholesale purchases.

Table 13 – Trend in Historical Yearly Wholesale Purchases

Year	Wholesale	year over year	Predicted	year over year
2012	30,091,478		29,777,247	
2013	30,301,350	0.70%	29,656,648	-0.41%
2014	30,157,452	-0.47%	29,740,002	0.28%
2015	29,896,472	-0.87%	29,781,966	0.14%
2016	29,672,839	-0.75%	31,176,723	4.68%
2017	29,169,681	-1.70%	29,723,118	-4.66%
2018	30,569,635	4.80%	30,612,534	2.99%
2019	30,054,521	-1.69%	30,210,028	-1.31%
2020	30,411,238	1.19%	30,368,142	0.52%
2021	30,738,254	1.08%	30,016,514	-1.16%

3.1.3.4 Determination of Weather Normalized Forecast

Much like the 2014 and 2018 Board approved load forecast, allocation to specific weather-sensitive rate classes (Residential, GS<50, GS>50) is based on the share (%) of each classes' actual retail kWh (exclusive of distribution losses) and a share of actual wholesale kWh. Weather normalized wholesale kWh, for historical years, are allocated to these classes based on these historical shares. Forecast values for 2022 and 2023 are allocated based on an average of 10 historical years. For those rate classes that use kW consumption as a billing determinant, sales for these customer classes are then converted to kW based on the historical volumetric relationship between kWh and kW. The utility then forecasts a consumption per customer and adds new customer's load to the total consumption for the class.

Allocation to specific non-weather sensitive rate classes (GS>50, USL, and Streetlights) is based on an average demand/customer. The utility then uses an appropriate historical average to determine an average demand per customer. This average is then applied to the customer count for the bridge and test year.

The following tables illustrate the methodology as described above for each of CHEI's classes.

Table 14 – Residential Forecast

Residential						
Year	**Residential Actual kWh**	**Total Actual Wholesale**	**Ratio%**	**Predicted Wholesale**	**Residential Weather Normal**	**Per customer**
2012	19,634,780	30,091,478	65.25%	29,777,247	19,429,743	10,867
2013	19,650,696	30,301,350	64.85%	29,656,648	19,232,601	10,744
2014	19,479,913	30,157,452	64.59%	29,740,002	19,210,265	10,619
2015	19,377,540	29,896,472	64.82%	29,781,966	19,303,322	10,413
2016	19,268,403	29,672,839	64.94%	31,176,723	20,244,968	10,526
2017	19,163,638	29,169,681	65.70%	29,723,118	19,527,230	9,793
2018	20,597,137	30,569,635	67.38%	30,612,534	20,626,041	9,852
2019	20,253,193	30,054,521	67.39%	30,210,028	20,357,986	9,308
2020	21,302,214	30,411,238	70.05%	30,368,142	21,272,026	9,530
2021	21,504,457	30,738,254	66.11%	30,016,514	19,842,820	8,673
2022			66.11%	30,383,005	20,085,093	8,779
2023		*10 Yr Avg*	66.11%	30,445,145	20,126,172	8,583

Table 15 – GS < 50kW Forecast

General Service < 50 kW						
Year	**Actual kWh**	**Total Wholesale**	**Ratio%**	**Predicted Wholesale**	**Weather Normal**	**Per customer**
2012	4,742,923	30,091,478	15.76%	29,777,247	4,693,395	29,894
2013	4,699,450	30,301,350	15.51%	29,656,648	4,599,463	28,927
2014	4,701,954	30,157,452	15.59%	29,740,002	4,636,868	29,163
2015	4,594,197	29,896,472	15.37%	29,781,966	4,576,601	27,737
2016	4,547,781	29,672,839	15.33%	31,176,723	4,778,272	29,062
2017	4,556,065	29,169,681	15.62%	29,723,118	4,642,507	28,337
2018	4,549,793	30,569,635	14.88%	30,612,534	4,556,178	27,544
2019	4,605,655	30,054,521	15.32%	30,210,028	4,629,485	28,214
2020	4,285,367	30,411,238	14.09%	30,368,142	4,279,294	26,375
2021	4,357,561	30,738,254	14.18%	30,016,514	4,255,245	26,066
2022			15.17%	30,383,005	4,607,587	28,102
2023		*10 Yr Avg*	15.17%	30,445,145	4,617,010	28,038

Table 16 – GS 50-4999kW Forecast (kWh)

General Service > 50 to 4999 kW						
Year	**Actual kWh**	**Total Wholesale**	**Ratio%**	**Predicted Wholesale**	**Weather Normal**	**Per customer**
2012	4,292,894	30,091,478	14.27%	29,777,247	4,248,065	386,188
2013	4,289,465	30,301,350	14.16%	29,656,648	4,198,201	381,655
2014	4,346,251	30,157,452	14.41%	29,740,002	4,286,089	389,644
2015	4,316,369	29,896,472	14.44%	29,781,966	4,299,837	390,894
2016	4,242,389	29,672,839	14.30%	31,176,723	4,457,403	405,218
2017	3,809,003	29,169,681	13.06%	29,723,118	3,881,271	415,850
2018	3,896,559	30,569,635	12.75%	30,612,534	3,902,027	433,559
2019	3,459,712	30,054,521	11.51%	30,210,028	3,477,613	386,401
2020	3,022,445	30,411,238	9.94%	30,368,142	3,018,162	335,351
2021	3,463,510	30,738,254	11.27%	30,016,514	3,382,186	375,798
2022			13.01%	30,383,005	3,952,566	449,076
2023		*10 Yr Avg*	13.01%	30,445,145	3,960,650	460,141

Table 17 – GS 50-4999kW Forecast (kW)

General Service > 50 to 4999 kW			
Year	**kWh**	**kW**	**KW/kWh Ratio**
2012	4,292,894	12,486	0.00291
2013	4,289,465	12,639	0.00295
2014	4,346,251	12,214	0.00281
2015	4,316,369	12,238	0.00284
2016	4,242,389	12,058	0.00284
2017	3,809,003	10,631	0.00279
2018	3,896,559	10,911	0.00280
2019	3,459,712	10,571	0.00306
2020	3,022,445	9,473	0.00313
2021	3,463,510	9,428	0.00272
2022	3,952,566	11,401	0.00288
2023	3,960,650	11,425	0.00288
		10 Yr Avg	*0.00288*

Table 18 – USL Forecast

USL			
Year	**kWh**	**kW**	**Customer**
2012	89,208		19
2013	89,208		19
2014	89,075		19
2015	94,284		19
2016	93,284		17
2017	93,084		17
2018	93,084		17
2019	93,084		17
2020	93,084		17
2021	93,084		17
2022	93,084		17
2023	93,084		17
		3 Yr Avg	*17*

Table 19 – Streetlighting Forecast

Street Lighting						
Year	**kWh**	**kW**	**Connection**	**kWh per connection**	**KW per connection**	**KW/kWh Ratio**
2012	355,537	1,003	409	869	2.4523	0.00282
2013	359,464	1,003	409	879	2.4523	0.00279
2014	359,464	1,003	409	879	2.4523	0.00279
2015	373,173	1,050	430	868	2.4419	0.00281
2016	321,015	920	487	660	1.8904	0.00287
2017	206,615	578	558	370	1.0358	0.00280
2018	208,985	583	558	375	1.0448	0.00279
2019	210,843	588	563	375	1.0453	0.00279
2020	212,836	592	579	368	1.0225	0.00278
2021	214,810	598	585	367	1.0224	0.00278
2022	231,922	627	609	381	1.0302	0.00270
2023	241,169	652	633	381	1.0295	0.00270
		3 Yr Avg	*575*	*370*	*1.0301*	*0.00279*

3.1.3.5 Final Load Forecast

The table below shows the derivation of proposed retail rates for Low Voltage ("LV") service. The 2023 estimates of total LV charges were calculated based on the last three years of actual charges from Hydro One.

Table 20 – Final Load and Customer Forecast

Final Load Forecast Results						
	Year	**2019**	**2020**	**2021**	**2022**	**2023**
Residential	Cust/Conn	2,144	2,187	2,232	2,288	2,345
	kWh	20,253,193	21,302,214	21,504,457	20,085,093	20,126,172
	kW					
GS < 50 kW	Cust/Conn	164	162	163	164	165
	kWh	4,605,655	4,285,367	4,357,561	4,607,587	4,617,010
	kW					
GS > 50 to 4999 kW	Cust/Conn	9	9	9	9	9
	kWh	3,459,712	3,022,445	3,463,510	3,952,566	3,952,566
	kW	10,571	9,473	9,428	11,401	11,425
USL	Cust/Conn	17	17	17	17	17
	kWh	93,084	93,084	93,084	93,084	93,084
	kW	-	-	-	-	-
Street Lighting	Cust/Conn	563	579	585	609	633
	kWh	210,843	212,836	214,810	231,922	241,169
	kW	588	592	598	627	652
Total	**Cust/Conn**	**2,897**	**2,954**	**3,006**	**3,086**	**3,168**
	kWh	**28,622,487**	**28,915,946**	**29,633,422**	**28,970,252**	**29,030,001**
	kW	**11,159**	**10,065**	**10,026**	**12,028**	**12,077**

3.1.4 Accuracy of Load Forecast

Given that the customer count has increased steadily and consistently over the past three cost of service applications and the total load forecast has declined, the assumption is that persisting conservation efforts put in place starting in 2011 up to 2019 have offset the increase in customers. The loss of GS <50 kW customers may help explain a portion of the reduction from 2018-2023. Changes in weather patterns, a shift of load from residential classes to other classes, and energy efficiencies (especially the Residential customer class) have contributed to the decline in load.

Table 21 – 2018 Board Approved Forecast vs 2023 Proposed Forecast

		2014 LF	2018 LF	2023 LF	2018-2023 $	2018-2023 %
Residential	Cust/Conn	2,048	2,100	2,345	245	11.67%
	kWh	22,293,395	21,429,449	20,126,172	- 1,303,277	-6.08%
	kW					
GS < 50 kW	Cust/Conn	168	172	165	- 7	-4.32%
	kWh	5,055,559	4,515,363	4,617,010	101,647	2.25%
	kW					
					-	
GS > 50 to 4999 kW	Cust/Conn	11	9	9		-4.36%
	kWh	4,276,256	3,657,814	3,952,566	294,752	8.06%
	kW	12,633	12,771	11,425	-1,346	-10.54%
USL	Cust/Conn	20	17	17	-1	-4.63%
	kWh	91,446	82,356	93,084	10,728	13.03%
	kW		-	-		
Street Lighting	Cust/Conn	425	530	633	104	19.59%
	kWh	382,524	207,000	241,169	34,169	16.51%
	kW	1,023	605	652	47	7.77%
					-	
					-	
Total	**Cust/Conn**	**2,672**	**2,828**	**3,168**	**340**	**12.02%**
	kWh	**32,099,180**	**29,891,982**	**29,030,001**	**- 861,981**	**-2.88%**
	kW	**13,656**	**13,376**	**12,077**	**- 1,299**	**-9.71%**

3.1.5 Determination of Customer Forecast

CHEI has used a simple geometric mean function to determine the forecasted customers for 2022 and 2023. The geometric mean is more appropriate when dealing with percentages and rates of change. Although the formula is somewhat simplistic, it reasonably represents CHEI's natural customer growth. CHEI notes that the MicroFit related consumption is included in the Wholesale Purchases. Historical customer counts and projected customer counts for 2017 and 2018 are presented in Table 11 below. A variance analysis of customer counts and projections is shown in the following table. CHEI notes that a 12-month average was used to determine the yearly customer/connection count to determine the bridge and test year forecast.

Table 22 – Customer Count Forecast

Customer Growth Chart										
	Residential		GS < 50 kW		GS > 50 to 4999 kW		USL		Street Lighting	
Date	Cust/Conn.	Grow Rate	Cust/Conn.	Grow Rate	Cust/Conn.	Grow Rate	Cust/Conn.	Grow Rate	Cust/Conn.	Grow Rate
2012	1788		157		11		19		409	
2013	1790	1.0011	159	1.0127	11	1.0000	19	1.0000	409	1.0000
2014	1809	1.0106	159	1.0000	11	1.0000	19	1.0000	409	1.0000
2015	1854	1.0247	165	1.0377	11	1.0000	19	0.9781	430	1.0513
2016	1923	1.0375	164	0.9965	11	1.0000	17	0.9238	487	1.1318
2017	1994	1.0367	164	0.9965	9	0.8485	17	0.9903	558	1.1466
2018	2094	1.0499	165	1.0097	9	0.9643	17	1.0000	558	1.0000
2019	2144	1.0243	164	0.9919	9	1.0000	17	1.0000	563	1.0081
2020	2187	1.0200	162	0.9888	9	1.0000	17	1.0000	579	1.0293
2021	2232	1.0206	163	1.0062	9	1.0000	17	1.0000	585	1.0102
Geomean		*1.0250*		*1.0043*		*0.9779*		*0.9877*		*1.0406*
2022	2288		164		9		17		609	
2023	2345		165		9		17		633	

3.1.6 Accuracy and Variance Analysis of the Customer/Connection Forecast

Table 23 – Customer Count Variance Analysis

Customer Class Name	Last Board Appr	2018	2019	2020	2021	2022	2023	2023	Var from 2018
Residential	**2,100**	+31	+17	+39	+45	+56	+57	**2,345**	245
General Service < 50 kW	**172**	-7	-1	-2	+1	+1	+1	**165**	-7
General Service > 50 to 4999 kW	**9**	0	0	0	0	-0	-0	**9**	-0
Unmetered Scattered Load	**17**	-0	0	0	0	-0	-0	**17**	-1
Street Lighting	**530**	+28	+9	+12	+6	+24	+25	**633**	104
TOTAL	**2,828**	+52	+25	+49	+52	+80	+82	**3,168**	**340**

As shown in the table above, the growth in customer count has increased slowly and steadily for the Residential Class. The projected growth of 56 residential customers for the bridge year and 57 residential customers for the test year is in line with actual projections from the utility. The Streetlight class has been growing in tandem with the residential class, as can be expected. The other classes have not seen any significant changes since the last Cost of Service. The General Service class has seen a slight decline since 2019. No changes are anticipated especially given the strain Covid has put on small businesses in the province.

3.2 CDM ADJUSTMENT TO LOAD FORECAST

3.2.1 CDM Adjustments

CHEI's persisting effects of CDM projects are embedded in the utility wholesale; therefore, no adjustment was made to the load forecast to account for CDM.

CHEI confirms that it was not contractually obligated to complete programs delivered by the distributor after April 2019. CHEI is not planning for or aware of any new CDM programs initiated in the Test Year (2023). Consequently, no manual CDM adjustment is required to the Load Forecast.