EXHIBIT 3
CUSTOMER AND LOAD FORECAST

2015 Cost of Service

Centre Wellington Hydro Ltd.
EB-2024-0012

Filed on: May 1, 2024

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3.2 CUSTOMER AND LOAD FORECAST

3.2.1 INTRODUCTION

The evidence presented in this exhibit provides information supporting the revenues derived from activities regulated by the Ontario Energy Board. Actual operating revenues from regulated operations are derived mainly from fixed and variable tariff charges as well as pass through charges and specific service charges. Revenues are collected from seven customer classes: Residential, General Service less than 50 kW, General Service 50-4,999 kW, Unmetered Scattered Load (USL), Sentinel and Street Lighting.

In this application, CWH has merged the General Service 50-2,999 kW and General Service 3000-4,999 kW into a new General Service 50-4,999 KW.

CWH assesses its customers' consumption on a yearly basis to determine whether it should remain in the GS>50kW class. During its annual evaluation, CWH noted that the lone customer in the GS 3,000-4,999 class had persistently lingered near the lower threshold level and was likely to move there based on recent demand.

While preparing its Cost of Service application, CWH examined the cost allocation component of these two distinct classes to see if there was any advantage in keeping both. While determining the weighting criteria and various elements, it was found that there is little or no cost difference between customers with monthly demand greater than 3,000kW and those with demand less than that level; therefore, to be consistent with utilities of similar sizes, CWH opted to create a new combined class namely GS 50-4999kW.

For the purposes of determining the proposed load forecast, more specifically with regard to the merged GS> 50 classes, CWH combined the historical consumption and customer count.

The table below shows the separate and aggregated data as a means of comparison. On average, the ratio between the GS 50-2999kW and the GS 3000-4999kW is 75/25.

Table 1: Comparison of Separate GS >50kW & Combined GS >50 classes.

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
General Service 50 to 2999 kW										
kWh	55,013,692	52,447,595	50,553,990	49,240,942	50,455,192	49,687,500	50,457,002	53,006,195	52,889,643	54,280,133
kW	154,260	148,977	145,124	139,855	143,527	143,971	143,721	153,226	158,869	160,434
Cust Count	56	54	47	49	52	53	53	58	59	60
General Service 3000 to 4999 kW										
kWh	18,461,823	17,295,612	18,344,949	17,984,374	18,999,941	18,101,354	14,539,031	15,601,730	14,802,768	12,558,797
kW	43,264	41,433	43,591	42,629	43,889	42,598	38,002	36,793	36,198	31,767
Cust Count	1	1	1	1	1	1	1	1	1	1
General Service 50 to 4999 kW										
kWh	73,475,515	69,743,207	68,898,939	67,225,316	69,455,133	67,788,854	64,996,033	68,607,925	67,692,411	66,838,929
kW	197,523	190,410	188,715	182,484	187,416	186,569	181,724	190,019	195,066	191,782
Cust Count	57	55	48	50	53	54	54	59	60	61

This exhibit also describes CWH's load and customer forecasts. The load forecast methodology and assumptions are described in detail at 3.1.4 Load Forecast Methodology.
The evidence herein is organized per the following topics;

1) Revenue and Load Forecast
2) Accuracy of Load Forecast and Variance Analysis

3.2.2 OVERVIEW OF REVENUE FORECAST

Table 2 below shows estimated revenues from current distribution charges based 2025 volumes. Distribution Revenues are derived through a combination of fixed monthly charges and volumetric charges applied to the utility's proposed Load Forecast. Fixed rate revenues are determined by applying the current fixed monthly charge to the number of customers or connections in each of the customer classes in each month. The revenues at proposed distribution rates are presented at Exhibit 6 and Exhibit 8.

Please note for presentation purposes the existing class GS 3,000-4,999 kW, in tables 2 and 3 below, has been moved to the GS 50-4,999 kW line.

Table 2: Revenues at Current Rates

2024 Rates at 2025 Load

	Test Year Projected Revenue from Existing Variable Charges							
Customer Class Name	**Variable Distribution Rate**	**per**	**Test Year Volume**	**Gross Variable Revenue**	**Transform. Allowance Rate**	**Transform. Allowance kW's**	**Transform. Allowance $'s**	**Net Variable Revenue**
Residential	$0.0000	kWh	46,859,680	$0.00			$0.00	$0.00
GS < 50 kW	$0.0254	kWh	23,066,635	$585,892.54			$0.00	$585,892.54
GS 50 to 4999 kW	$4.8997	kW	189,552	$928,745.90	-0.60	125,597	-$75,358.20	$853,387.70
Unmetered Scattered Load	$0.0142	kWh	566,996	$8,051.35			$0.00	$8,051.35
Sentinel Lighting	$17.8733	kW	92	$1,650.13			$0.00	$1,650.13
Street Lighting	$12.3517	kW	1,501	$18,538.34			$0.00	$18,538.34
Total Variable Revenue			**70,684,456**	**$1,542,878.26**		125,597	-$75,358.20	$1,467,520.06

2024 Rates at 2025 Load

	Test Year Projected Revenue from Existing Fixed Charges							
Customer Class Name	**Fixed Rate**	**Customers (Connections)**	**Fixed Charge Revenue**	**Variable Revenue**	**TOTAL**	**% Fixed Revenue**	**% Variable Revenue**	**% Total Revenue**
Residential	$33.7900	6,794	$2,754,993.68	$0.00	$2,754,993.68	100.00%		59.01%
GS < 50 kW	$24.3800	809	$236,656.45	$585,892.54	$822,548.99	28.77%	71.23%	17.62%
GS 50 to 4999 kW	$198.9300	62	$148,490.09	$853,387.70	$1,001,877.79	14.82%	85.18%	21.46%
Unmetered Scattered Load	$9.1500	13	$1,376.04	$8,051.35	$9,427.39	14.60%	85.40%	0.20%
Sentinel Lighting	$6.7500	25	$2,015.40	$1,650.13	$3,665.53	54.98%	45.02%	0.08%
Street Lighting	$2.5500	1,890	$57,845.80	$18,538.34	$76,384.14	75.73%	24.27%	1.64%
Total Fixed Revenue		**9,593**	**$3,201,377.46**	**$1,467,520.06**	**$4,668,897.52**			

Table 3: Revenues at Proposed Rates

2025 Rates at 2025 Load

	Test Year Projected Revenue from Proposed Variable Charges							
Customer Class Name	**Variable Distribution Rate**	**per**	**Test Year Volume**	**Gross Variable Revenue**	**Transform. Allowance Rate**	**Transform. Allowance kW's**	**Transform. Allowance $'s**	**Net Variable Revenue**
Residential	$0.0000	kWh	46,859,680	$0.00			$0.00	$0.00
GS < 50 kW	$0.0263	kWh	23,066,635	$605,737			$0.00	$605,737
GS 50 to 4999 kW	$5.0790	kW	189,552	$962,732	-0.60	125,597	-$75,358	$887,372
Unmetered Scattered Load	$0.0228	kWh	566,996	$12,947			$0.00	$12,947
Sentinel Lighting	$18.4762	kW	92	$1,706			$0.00	$1,706
Street Lighting	$19.8975	kW	1,501	$29,864			$0.00	$29,864
Total Variable Revenue			**70,684,456**	**$1,612,985**		125,597	-$75,358	$1,537,626

2025 Rates at 2025 Load

	Test Year Projected Revenue from Proposed Fixed Charges							
Customer Class Name	**Fixed Rate**	**Customers (Connections)**	**Fixed Charge Revenue**	**Variable Revenue**	**TOTAL**	**% Fixed Revenue**	**% Variable Revenue**	**% Total Revenue**
Residential	$34.33	6,794	$2,798,685	$0.00	$2,798,685	98.44%		59.01%
GS <50 kW	$25.21	809	$244,713	$605,737	$850,451	27.83%	71.23%	17.62%
GS 50 to 2999 kW	$198.93	62	$148,490	$887,372	$1,035,863	14.33%	85.18%	21.46%
Unmetered Scattered Load	$14.71	13	$2,212	$12,947	$15,159	9.08%	85.40%	0.20%
Sentinel Lighting	$6.98	25	$2,084	$1,706	$3,790	53.18%	45.02%	0.08%
Street Lighting	$4.12	1,890	$93,461	$29,864	$123,324	46.91%	24.27%	1.64%
Total Fixed Revenue		**9,593**	**$3,289,645**	**$1,537,626**	**$4,827,272**			

A completed Appendix 2-IB Load Forecast Analysis is presented in Tab 10 of the RRWF.

3.2.3 PROPOSED LOAD FORECAST

The following section of the application covers the approach taken to determine the Load Forecast. This section also covers economic assumptions and data sources for customer and load forecasts. It explains wholesale purchases and subsequent adjustments to the wholesale purchases. It also provides the rationale behind each variable used in the regression analysis. Lastly, it presents the regression results and explains how they were used to determine the forecast for the bridge and test year. Table 4 below presents the actual and forecast trends for customer/connection counts, kWh consumption and billed kW demand. The forecast trend is what CWH has based its proposed rates on.

Table 4: Customer and Volume Trend Table

	Year	2018BA	2018	2019	2020	2021	2022	2023	2024	2025
Residential	Cust/Conn	6,107	6,172	6,268	6,383	6,493	6,593	6,621	6,707	6,794
	kWh	44,844,896	46,568,391	45,878,451	49,496,753	49,937,426	50,179,106	49,125,071	46,774,066	46,859,680
General Service < 50 kW	Cust/Conn	758	749	760	782	779	786	790	800	809
	kWh	20,920,091	23,320,954	22,669,049	23,240,083	23,835,443	25,258,077	25,014,670	23,024,492	23,066,635
General Service 50 to 4999 kW	Cust/Conn	45	53	54	54	59	60	61	62	62
	kWh	77,522,672	69,455,133	67,788,854	64,996,033	68,607,925	67,692,411	66,838,929	68,125,506	68,250,201
	kW	201,404	187,416	186,569	181,724	190,019	195,066	191,782	189,205	189,552
Unmetered Scattered Load	Cust/Conn	13	13	13	13	14	14	12	13	13
	kWh	559,426	571,748	585,041	589,141	619,395	631,477	644,042	561,768	566,996
Sentinel Lighting	Cust/Conn	29	27	26	26	26	26	26	25	25
	kWh	39,009	36,405	35,563	35,581	35,485	35,485	35,152	33,332	33,332
	kW	101	101	99	99	99	98	98	92	92
Street Lighting	Cust/Conn	1,716	1,758	1,802	1,826	1,845	1,845	1,854	1,872	1,890
	kWh	569,977	520,136	517,704	525,998	532,299	530,327	534,834	539,188	544,453
	kW	1,520	1,436	1,429	1,445	1,467	1,467	1,472	1,486	1,501
Total	**Cust/Conn**	**8,668**	**8,773**	**8,923**	**9,084**	**9,215**	**9,325**	**9,366**	**9,479**	**9,593**
	kWh	**144,456,071**	**140,472,767**	**137,474,662**	**138,883,589**	**143,567,973**	**144,326,883**	**142,192,699**	**139,058,353**	**139,321,298**
	kW	**203,030**	**188,954**	**188,096**	**183,268**	**191,585**	**196,631**	**193,352**	**190,784**	**191,145**

Note: the customer numbers shown in the table above represent a yearly average.

3.2.4 LOAD FORECAST METHODOLOGY AND DETAIL

CWH's load forecast is prepared in two phases. The first phase, a billed energy forecast by customer class for 2025 is developed using a total purchase (**Wholesale**) basis regression analysis. Then, in the second phase, usage associated with the known change in customers for 2025 is determined and added (if applicable) (**Adjusted Wholesale**). 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 whether there are 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 of those means are statistically significantly different from each other. The utility did not test the NAC method due to the fact that 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 provide a measure of how much, and for how long, the outside temperature was above that base temperature.

For degree days, daily observations as reported at Fergus Shand Dam 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.

Explanation of Multiple Regression Analysis

Multiple regression can be utilized for forecasting purposes by analyzing how a number of variables has affected a depended variable historically. From this, the relationship between these variables and the depended variable can be expressed as:

$Y=A+B1X1+B2X2…+bNxN + E$

Where:

- Y = Predicted depended variable value
- A = the value of Y when all Xs are zero
- X = the independent variable
- B = the coefficients corresponding to the independent variables
- N = the number of independent variables
- E = an error term

By forecasting the independent variables, the dependent variable can be predicted. However, to ascertain that the relationship is not coincidental, the utility must first assess the correlation

between the dependent and individual independent variables. This can be accomplished by the Person Correlation Coefficient (otherwise known as "R") to each independent variable. This depicts how much of the change in the depended variable can be explained by the change in independent variables. Those variables with a high R-squared should then be used for multiple regression. The same correlation coefficient can be applied to multiple independent variables to ascertain how much of the change in dependent variable can be explained by changes in all independent variables.

R Squared=(B'X'Y – nAVG(Y)^2)/Y'Y-nAVG(Y)^2)
Where:
B',X',Y' = Matrixes of all combinations of B,X&Y respectively
^2 = Squared

The adjusted R-squared is calculated by "correcting" for the number of independent variables in a multiple regression analysis. The formula: Adj RSq=(1-(1-RSq)*((n-1)/(n-k)). It is often used to compare models involving different numbers of coefficients. The statistical significance of the multiple regression can be tested with the F-test which is derived from a normal probability distribution. A critical point along the distribution can be found given a degree of confidence required, the number of variables and the number of observations. If the F-statistic is above this point, then the analysis can be deemed statistically significant at the level of confidence.
F-statistic = (R Squared/k-1)/(1-R Squared)/(n-k)
Where:
K = number of independent variable
n = number of observations

Independent variables that are highly correlated themselves, can lead to high variances in slope estimation (B). This is known as "Multicollinearity". For this reason, independent variables with a high level of multicollinearity to the other independent variables should consider being omitted from the analysis.

3.2.5 ECONOMIC OVERVIEW

The Township of Centre Wellington is a community in south-central Ontario. The community is located approximately just over a one-hour drive west of Toronto. CWH is within a 30-minute drive to larger city centers such as Guelph, Waterloo and Kitchener. Centre Wellington is within a 40-minute drive to access the major 401 highway. Traditionally a hub for agriculture and manufacturing, Centre Wellington's thriving business community offers a diverse industrial base whose growth sectors include manufacturing, agriculture, health services and creative industry. With a young, well-educated and skilled workforce coupled with access to local and international markets, there is plenty of opportunity to start, grow and achieve success in a wide variety of businesses.

A modest increase in residential and small commercial and industrial connections are expected over the next 10 years as the area serviced by CWH is reaching capacity.

With respect to climate, CWH has a continental climate with cool winters, humid summers, and short autumns and springs.
The first snowfall of the year usually occurs in mid-to-late November, but snow does not actually cover the ground until late December. Before that, snow usually melts as soon as it hits the ground.

In the spring, the snow usually starts melting in March, although occasional "warm breaks" with temperatures as high as 10 °C (50 °F) usually occur once or twice in March.

In recent years, winters have gotten much warmer, so often in the winter freezing rain will occur.
In the summer, humidity is often common, especially in July. Although temperatures are usually just under 30 °C (86 °F), with the humidity it can feel as hot as 35 °C.

Although the Municipality is growing at a fast pace, CWH’s service territory is near saturation. Generally, the customer count in the service area has seen a nominal average increase over the past years.

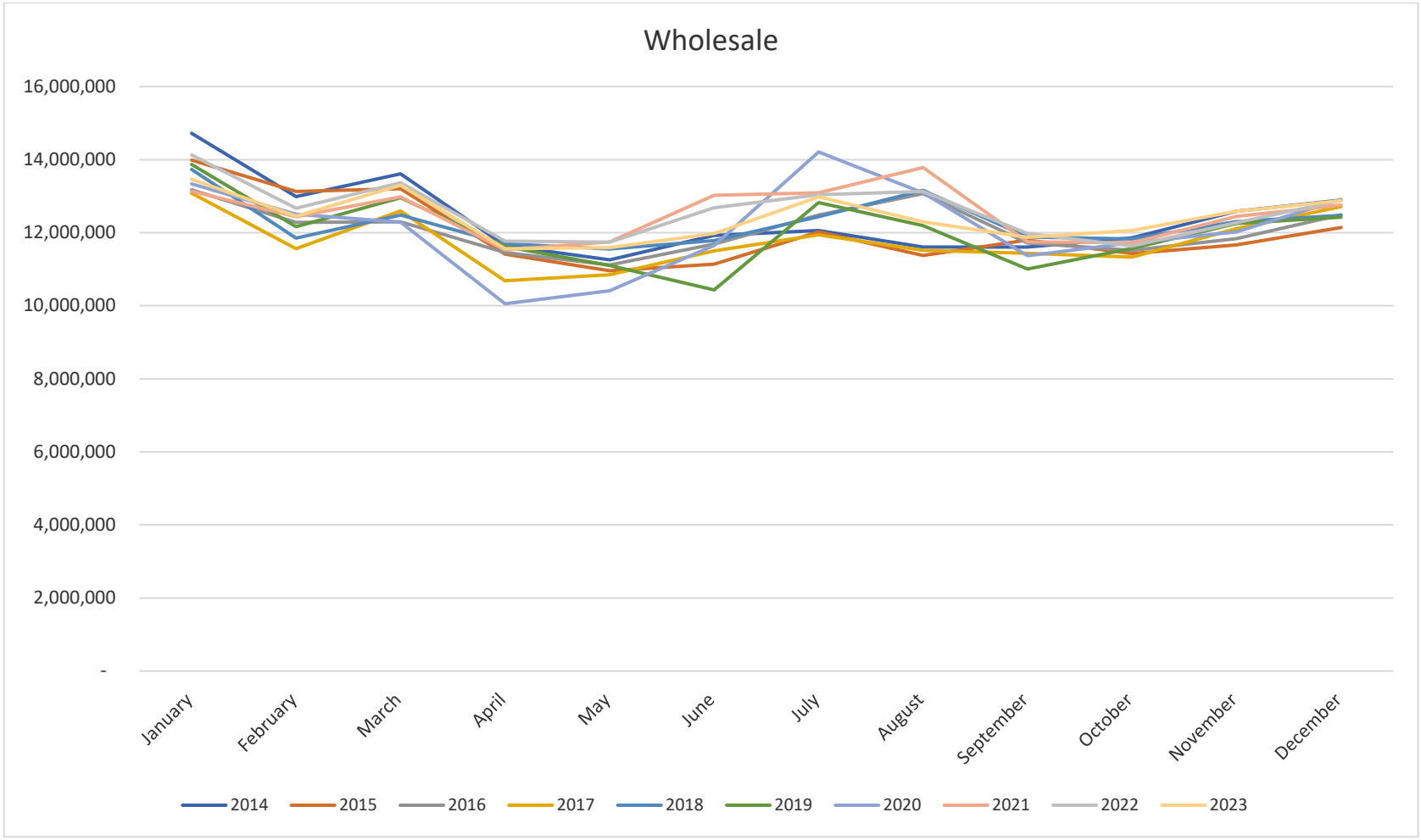
3.2.6 OVERVIEW OF WHOLESALE PURCHASES

CWH purchases electricity from Hydro One, IESO and embedded generation. The following table outlines the unadjusted monthly wholesale purchases:

Table 5: Wholesale Purchases 2014-2023 (include MicroFit and Fit)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
January	14,721,919	13,987,815	13,174,538	13,082,576	13,732,592	13,869,144	13,335,593	13,139,559	14,129,842	13,462,585
February	12,985,802	13,128,236	12,284,962	11,560,432	11,854,075	12,164,773	12,506,154	12,437,783	12,669,017	12,452,844
March	13,614,019	13,204,373	12,300,226	12,598,448	12,481,539	12,959,777	12,290,119	12,977,607	13,368,489	13,300,417
April	11,649,899	11,410,552	11,457,705	10,685,697	11,694,408	11,618,308	10,055,475	11,530,474	11,769,512	11,562,298
May	11,257,042	10,958,434	11,116,984	10,848,464	11,554,976	11,099,815	10,411,998	11,746,735	11,743,868	11,590,686
June	11,926,426	11,142,226	11,688,878	11,502,695	11,782,667	10,434,063	11,649,992	13,022,595	12,681,205	11,977,467
July	12,057,151	12,019,416	12,484,095	11,942,560	12,441,763	12,827,708	14,210,493	13,093,636	13,038,715	12,981,261
August	11,607,472	11,373,888	13,068,297	11,515,711	13,156,626	12,194,089	13,094,749	13,784,599	13,131,059	12,296,645
September	11,603,451	11,797,719	11,716,456	11,436,109	11,883,427	11,008,177	11,371,655	11,750,197	11,975,751	11,875,936
October	11,860,237	11,426,239	11,516,592	11,330,858	11,826,933	11,566,527	11,729,500	11,722,862	11,636,408	12,060,832
November	12,586,539	11,667,095	11,833,726	12,110,547	12,302,521	12,250,620	12,026,583	12,448,469	12,271,891	12,585,492
December	12,891,167	12,145,135	12,494,117	12,712,916	12,473,736	12,426,483	12,910,705	12,760,061	12,885,804	12,875,414
	148,761,122	144,261,131	145,136,576	141,327,012	147,185,262	144,419,484	145,593,015	150,414,577	151,301,561	149,021,877

The CWH's load has increased by 0.18% from 2014 to 2023. The lowest year consumption was in 2017 while the largest consumption was in 2022.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3.2.7 OVERVIEW OF VARIABLES USED

In CWH's case, variation in monthly electricity consumption is influenced by five main factors – weather, both heating and cooling, which are by far the most dominant effects for most systems; days per month Spring/Fall, a Covid flag and lastly Customer Number. Specifics relating to each variable used in the regression analysis are presented in the next section.

Heating and Cooling:
In order 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 that the mean temperature is above 18°C. For CWH, the monthly HDD and CDD as reported at Fergus Shand Dam were used.

CWH has adopted a 10-year average from 2014 to 2023 as the definition of weather normal. Our view is that a ten-year average, based on the most recent ten calendar years available, is a reasonable compromise that likely reflects the "average" weather experienced in recent years. Many other LDCs have also adopted this definition for the purposes of cost-of-service rebasing.

The following table outlines the monthly weather data used in the regression analysis.

Table 6: HDD and CDD as reported at Utility Location

HDD	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
January	889.50	861.10	737.00	669.60	792.10	805.70	677.80	709.60	897.70	642.80
February	816.10	924.10	639.30	550.10	609.90	656.90	694.00	735.00	716.50	620.40
March	768.20	683.70	517.10	620.00	607.50	676.80	537.30	529.20	597.60	603.30
April	401.60	367.60	421.90	289.90	494.90	494.90	413.20	340.70	396.00	332.80
May	162.90	109.80	162.70	216.10	81.60	184.40	234.20	197.30	129.70	173.10
June	22.60	46.30	41.10	45.70	33.70	54.50	38.80	20.20	49.50	34.00
July	30.70	12.20	3.70	4.10	2.50	0.00	0.00	11.80	3.60	1.90
August	24.80	17.10	2.00	25.80	2.20	12.80	5.10	3.40	3.40	23.10
September	100.20	39.30	49.40	71.90	70.20	80.40	114.60	76.30	80.80	68.80
October	273.00	293.30	228.60	202.40	321.10	289.00	337.60	188.50	298.80	243.70
November	541.00	377.30	382.70	486.80	557.40	575.10	400.60	486.30	438.20	491.80
December	620.70	476.60	664.10	743.50	621.90	659.30	635.00	589.10	585.40	528.60

CDD	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
January	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
February	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
March	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
April	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
May	7.60	31.20	23.90	6.60	35.60	2.00	25.40	14.90	18.40	8.80
June	46.30	17.90	40.30	38.80	44.80	23.30	54.10	74.30	39.70	39.90
July	38.50	67.50	117.60	58.20	101.30	118.20	139.40	62.80	70.30	71.60
August	42.60	45.60	131.20	38.00	108.40	46.00	75.70	112.40	72.50	26.50
September	15.90	51.50	36.80	48.30	58.20	9.20	7.60	1.90	17.90	22.80
October	0.00	0.00	3.10	3.10	4.60	0.80	0.00	1.80	0.00	7.10
November	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
December	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Days per month:

Lastly, CWH also tested a “Days per month” variable. Although the variables did not yield particularly significant results, it did slightly improve the R-Square and therefore CWH opted to keep it as a variable.

All relevant scenarios tested by the utility can be found in the regression model at table 6 entitled Regression Scenarios.

Using a combination of wholesale purchases and the variables listed above, a multiple regression analysis was used to develop an equation describing the relationship between monthly actual wholesale kWh and the explanatory variables.

To project the adjusted wholesale purchases for the bridge and test year, the model uses for the most part a simple average of historical data. CWH has applied this method of prediction to all variables.

Spring and Fall Flag:

CWH 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".

Covid Flag:

CWH tested and included a Covid flag to identify the lockdown of March, April and May of 2020. This variable has been used in many applications and has proven to be favorable in CWH's case.

Origin of variables

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

Rational for including and excluding variables.

During the process of testing the regression analysis, many different variables and times periods are tested to arrive to what the utility deems as the best R-Squared. CWH's rational behind selecting or dropping certain variables involves a "no-worst" rational. 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.

Regression results are shown and explained in the following section.

3.2.8 REGRESSION RESULTS

Table 7 below presents the regression results used to determine the load forecast.

Table 7: Correlation/Regression Results

R Squared	**0.8395**				**1.993**	**Durbin-Watson Statistic**				
Adjusted R Squared	**0.8310**				**1.62 - 1.79**	**Positive autocorrelation detected**				
Standard Error	**336119.5938**				**2.176**	**Critical F-Statistic - 95% Confidence**				
F - Statistic	**98.5394**				**91.87%**	**Confidence to which analysis holds**				
Multiple Regression Equation					**Independent Analysis**			**Auto Correlation**	**Multicollinearity**	
	Coefficients	**Standard Error**	**t Stat**	**p Value**	**R Squared**	**Coefficient**	**Intercept**	**Dl=1.69 Du=1.72**	**Adjusted R-Squared against other Indep**	
Intercept	1,357,458.707	1,417,105.174	0.958	34.02%				**DW-Stat**		
HDD	3,292.698	173.716	18.954	0.00%	24.28%	1434.77	11472353.00	**0.34**	58.36%	
CDD	20,640.879	1,629.174	12.670	0.00%	2.04%	3568.90	11893399.00	**0.80**	65.16%	
Days in month	251,234.290	38,777.618	6.479	0.00%	2.76%	164030.93	6973631.50	**2.96**	3.73%	
Spring/Fall	-145,170.135	76,974.616	-1.886	6.19%	22.73%	-776374.07	12353826.00	**1.34**	33.65%	
Covid	-1,442,050.582	200,140.449	-7.205	0.00%	8.35%	-1506802.27	12003309.00	**0.69**	-0.65%	
Customer	214.186	111.959	1.913	5.83%	0.00%	-15.32	12074440.00	**0.02**	-3.15%	

The resulting regression equation yields an adjusted R-squared of 0.83. When actual annual wholesale values are compared to annual values predicted by the regression equation, the mean absolute percentage error (MAPE) is 0.27 per cent. More detailed model statistics can be found in the next section.

Table 8: Wholesale vs Adjusted (removing known changes in load)

Actual Wholesale vs Post Adjustment Wholesale						
Year	**kWh Purchased**	**year over year**	**Adjusted**	**year over year**	**Purch. VS Adj.**	
2014	148,761,122		145,661,558		-2.08%	
2015	144,261,131	-3.02%	142,939,977	-1.87%	-0.92%	
2016	145,136,576	0.61%	143,959,879	0.71%	-0.81%	
2017	141,327,012	-2.62%	140,102,693	-2.68%	-0.87%	
2018	147,185,262	4.15%	146,076,623	4.26%	-0.75%	
2019	144,419,484	-1.88%	143,375,282	-1.85%	-0.72%	
2020	145,593,015	0.81%	140,693,839	-1.87%	-3.36%	
2021	150,414,577	3.31%	144,550,584	2.74%	-3.90%	
2022	151,301,561	0.59%	145,384,291	0.58%	-3.91%	
2023	149,021,877	-1.51%	143,132,132	-1.55%	-3.95%	

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

Table 9: Wholesale vs Predicted using the coefficients from the regression results

Year	Wholesale	year over year	Predicted	year over year	Wholesale VS Predicted
2014	148,761,122		142,711,554		4.07%
2015	144,261,131	-3.02%	144,742,180	1.42%	0.33%
2016	145,136,576	0.61%	141,643,465	-2.14%	2.41%
2017	141,327,012	-2.62%	146,141,861	3.18%	3.41%
2018	147,185,262	4.15%	144,222,537	-1.31%	2.01%
2019	144,419,484	-1.88%	141,296,568	-2.03%	2.16%
2020	145,593,015	0.81%	144,293,681	2.12%	0.89%
2021	150,414,577	3.31%	144,577,389	0.20%	3.88%
2022	151,301,561	0.59%	142,374,651	-1.52%	5.90%
2023	149,021,877	-1.51%	145,170,626	1.96%	2.58%

Table 10, as seen below, shows the results of the mean absolute deviation (MAD), the mean square error (MSE), the root mean square (RMSE) and the mean absolute Percentage error (MAPE).

Table 10: MAP-MSE-MAPE

Period	Actual	Forecast	Error	Absolute Value of Error	Square of Error	Absolute Values of Errors Divided by Actual Values.
t	A_t	F_t	$A_t - F_t$	$\lvert A_t - F_t \rvert$	$(A_t - F_t)^2$	$\lvert (A_t - F_t)/A_t \rvert$
1	0	0	0	0	0	
2	148,761,122	142,711,554	6,049,568	6,049,568	36,597,275,577,214	0.0407
3	144,261,131	144,742,180	-481,049	481,049	231,408,019,108	0.0033
4	145,136,576	141,643,465	3,493,111	3,493,111	12,201,821,604,110	0.0241
5	141,327,012	146,141,861	-4,814,849	4,814,849	23,182,770,574,025	0.0341
6	147,185,262	144,222,537	2,962,725	2,962,725	8,777,741,549,964	0.0201
7	144,419,484	141,296,568	3,122,915	3,122,915	9,752,599,121,171	0.0216
8	145,593,015	144,293,681	1,299,334	1,299,334	1,688,269,183,175	0.0089
9	150,414,577	144,577,389	5,837,188	5,837,188	34,072,761,562,124	0.0388
10	151,301,561	142,374,651	8,926,910	8,926,910	79,689,713,859,364	0.0590
11	149,021,877	145,170,626	3,851,251	3,851,251	14,832,133,356,126	0.0258
Total		30247103.848	40838899.530	221026494406380.000	0.276	

The mean absolute deviation (MAD) is the sum of absolute differences between the actual value and the forecast divided by the number of observations.

Mean square error (MSE) is probably the most used error metric. It penalizes larger errors because squaring larger numbers has a greater impact than squaring smaller numbers. The MSE is the sum of the squared errors divided by the number of observations.

Mean Absolute Percentage Error (MAPE) is the average of absolute errors divided by actual observation values.

CWH has used a different weather station in the 2025 proposed load forecast therefore the utility is not providing an alternative twenty-year normal weather condition.

3.2.9 DETERMINATION OF CUSTOMER FORECAST

CWH has used a simple geometric mean function to determine the forecasted number of customers for 2024 and 2025. The geometric mean is more appropriate to use when dealing with percentages and rates of change. Although the formula is somewhat simplistic, it is reasonably representative of CWH's natural customer growth. The geometric mean results were analyzed by CWH and then further adjusted for known particulars. Historic customer counts and projected customer counts for 2024 and 2025 are presented in Table 11 below. CWH has used a 12 month average as an input to the geomean calculation.

A variance analysis of customer counts and projections is presented at 3.2.10. CWH used an average customer count as a base for its calculations.

Table 11: Customer Forecast

	Residential		General Service < 50 kW		General Service 50 to 2999 kW		General Service 50 to 4999 kW	General Service 3000-4999 kW		Unmetered Scattered Load			Sentinel Lighting		Street Lighting	
Date	**Cust or Conn.**	**Growth Rate**	**Cust or Conn.**	**Growth Rate**	**Cust or Conn.**	**Growth Rate**	**Cust or Conn.**	**Cust or Conn.**	**Growth Rate**	**Cust or Conn.**	**Growth Rate**		**Cust or Conn.**	**Growth Rate**	**Cust or Conn.**	**Growth Rate**
2014	5947		716		56			1		13			31		1707	
2015	5957	1.0017	728	1.0173	54	0.9513		1	1.0000	13	1.0000		31	1.0000	1709	1.0010
2016	5986	1.0048	742	1.0180	47	0.8727		1	1.0000	13	1.0000		31	0.9892	1706	0.9983
2017	6056	1.0116	747	1.0076	49	1.0498		1	1.0000	13	1.0000		27	0.8804	1700	0.9967
2018	6172	1.0193	749	1.0019	52	1.0644		1	1.0000	13	1.0000		27	1.0000	1759	1.0343
2019	6268	1.0155	760	1.0148	53	1.0127		1	1.0000	13	1.0000		26	0.9691	1800	1.0238
2020	6383	1.0184	782	1.0293	53	0.9906		1	1.0000	13	1.0128		26	0.9936	1826	1.0142
2021	6493	1.0171	779	0.9961	58	1.1048		1	1.0000	14	1.0633		26	1.0000	1845	1.0102
2022	6593	1.0155	786	1.0094	59	1.0115		1	1.0000	14	1.0000		26	1.0000	1845	1.0002
2023	6621	1.0043	790	1.0052	60	1.0298		1	1.0000	12	0.8869		26	1.0000	1854	
Geomean		*1.0130*		*1.0118*		*1.0049*			*1.0000*		*1.0093*			*0.9783*		*1.0098*
2024	6707		800		61			1		13			25		1872	
2025	6794		809				62			13			25		1890	

3.2.10 CUSTOMER COUNT VARIANCE ANALYSIS

The table below illustrates that CWH's customer count has exhibited a consistent pattern over the last decade or so, with an average annual growth rate of 77 for the Residential Class and 8 for the GS >50 class.

The expansion is typical and consists primarily of newly constructed homes and facilities within the service area. CWH does not expect significant expansion over the next five years, as it has reached its maximum capacity for new development.

Table 12: Customer/Connection Variance Analysis

Customer/Connection Count						
Year	**Residential**	**GS < 50 kW**	**GS 50 to 4999 kW**	**USL**	**Sentinel Lights**	**Street Lights**
2014	5947	716	57	13	31	1707
2015	5957	728	55	13	31	1708
2016	5985	742	48	13	31	1704
2017	6056	747	50	13	27	1696
2018	6172	749	53	13	27	1758
2019	6268	760	54	13	26	1802
2020	6383	782	54	13	26	1826
2021	6493	779	59	14	26	1845
2022	6593	786	60	14	26	1845
2023	6621	790	61	12	26	1854
2024	6707	800	62	13	25	1872
2025	6794	809	62	13	25	1890
Year over Year Analysis						
Year	**Residential**	**GS < 50 kW**	**GS 50 to 4999 kWh**	**USL**	**Sentinel Lighting**	**Street Lighting**
2015	10	12	-3	0	0	1
2016	28	13	-7	0	0	-4
2017	71	6	2	0	-4	-9
2018	117	2	3	0	0	63
2019	96	11	1	0	-1	44
2020	115	22	-1	0	0	24
2021	109	-3	6	1	0	18
2022	101	7	1	0	0	0
2023	28	4	1	-2	0	9
2024	86	9	0	0	-1	18
2025	87	9	0	0	-1	18
Avg	**77**	**8**	**0**	**0**	**-1**	**17**

Table 13: 2018 Board Approved vs Proposed 2025 Customer Numbers

	Year	2018BA	2025	Var
Residential	Cust/Conn	6,107	6,794	687
General Service < 50 kW	Cust/Conn	758	809	51
General Service 50 to 4999 kW	Cust/Conn	45	62	17
Unmetered Scattered Load	Cust/Conn	13	13	-0
Sentinel Lighting	Cust/Conn	29	25	-4
Street Lighting	Cust/Conn	1,716	1,890	174
Total	**Cust/Conn**	**8,668**	**9,593**	**925**

Consistent with the prior explanation, the comparison between the last board approved and the 2025 proposed customer count is supported by the cumulative and predictable annual addition of 75-100 customers.

3.2.11 DETERMINATION OF 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) in the actual wholesale kWh. Weather normalized wholesale kWh, for historical years, are allocated to these classes based on these historical shares. Forecast values for 2024 and 2025 are allocated based on the average historical actual shares. For those rate classes that use kW demand as a billing determinant, sales forecast for these customer classes are then converted to kW based on the historical volumetric relationship between kWh and kW.

The table below shows CWH's actual retail consumption by class and the year over year variances.

The purpose of the regression analysis is to identify variables that explains the monthly fluctuations in wholesale load. Therefore, the year over year variances can be for the most attributed to weather patterns and the addition of customers.

Table 14: Historical Retail Consumption and Demand

Retail Consumption by Class										
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Residential										
kWh	46,177,614	45,098,159	44,914,361	43,252,063	46,568,391	45,878,451	49,496,753	49,937,426	50,179,106	49,125,071
General Service < 50 kW										
kWh	20,579,869	21,387,560	23,270,825	23,043,701	23,320,954	22,669,049	23,240,083	23,835,443	25,258,077	25,014,670
General Service 50 to 4999 kW										
kWh	73,475,515	69,743,207	68,898,939	67,225,316	69,455,133	67,788,854	64,996,033	68,607,925	67,692,411	66,838,929
kW	197,523	190,410	188,715	182,484	187,416	186,569	181,724	190,019	195,066	191,782
Unmetered Scattered Load										
kWh	563,396	563,839	562,067	563,770	571,748	585,041	589,141	619,395	631,477	644,042
Sentinel Lighting										
kWh	39,277	39,278	39,314	36,467	36,405	35,563	35,581	35,485	35,485	35,152
kW	109	109	109	101	101	99	99	99	98	98
Street Lighting										
kWh	1,141,797	976,129	566,049	527,903	520,136	517,704	525,998	532,299	530,327	534,834
kW	3,151	2,727	1,555	1,455	1,436	1,429	1,445	1,467	1,467	1,472

Year over Year Variance										
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Residential										
kWh		(1,079,455)	(183,798)	(1,662,298)	3,316,328	(689,940)	3,618,302	440,673	241,680	(1,054,035)
General Service < 50 kW										
kWh		807,691	1,883,265	(227,124)	277,253	(651,905)	571,034	595,360	1,422,634	(243,407)
General Service 50 to 4999 kW										
kWh		(3,732,308)	(844,268)	(1,673,623)	2,229,817	(1,666,279)	(2,792,820)	3,611,892	(915,514)	(853,482)
kW		(7,113)	(1,695)	(6,231)	4,932	(847)	(4,846)	8,295	5,047	(3,284)
Unmetered Scattered Load										
kWh		443	(1,772)	1,703	7,978	13,293	4,100	30,254	12,082	12,565
Sentinel Lighting										
kWh		1	36	(2,847)	(62)	(842)	18	(96)	-	(333)
kW		-	(0)	(8)	-	(3)	0	(0)	(0)	(1)
Street Lighting										
kWh		(165,668)	(410,080)	(38,146)	(7,767)	(2,432)	8,294	6,301	(1,972)	4,507
kW		(424)	(1,172)	(100)	(19)	(8)	16	22	(0)	5

3.2.12 FINAL WEATHER ADJUSTED LOAD FORECAST

Below provides details of the Customer and Volume Load Forecast compared to the 2018 Board Approved values. This summary of the billing determinants by rate class will be used to develop CWH's proposed rates.

Table 15: Proposed Load and Customer Forecast

	Year	2018BA	2024	2025
Residential	Cust/Conn	6,107	6,707	6,794
	kWh	44,844,896	46,774,066	46,859,680
General Service < 50 kW	Cust/Conn	758	800	809
	kWh	20,920,091	23,024,492	23,066,635
General Service 50 to 4999 kW	Cust/Conn	45	62	62
	kWh	61,343,551	68,125,506	68,250,201
	kW	158,301	189,205	189,552
Unmetered Scattered Load	Cust/Conn	13	13	13
	kWh	559,426	561,768	566,996
Sentinel Lighting	Cust/Conn	29	25	25
	kWh	39,009	33,332	33,332
	kW	101	92	92
Street Lighting	Cust/Conn	1,716	1,872	1,890
	kWh	569,977	539,188	544,453
	kW	1,520	1,486	1,501
Total	**Cust/Conn**	**8,668**	**9,479**	**9,593**
	kWh	**128,276,950**	**139,058,353**	**139,321,298**
	kW	**159,922**	**190,784**	**191,145**

The table below details the historical years actual load and customer values in addition to the forecast for the bridge and test year.

Table 16: Final Customer and Volume Load Forecast

Final Load Forecast Results										
	Year	**2018BA**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Residential	Cust/Conn	6,107	6,172	6,268	6,383	6,493	6,593	6,621	6,707	6,794
	kWh	44,844,896	46,568,391	45,878,451	49,496,753	49,937,426	50,179,106	49,125,071	46,774,066	46,859,680
General Service < 50 kW	Cust/Conn	758	749	760	782	779	786	790	800	809
	kWh	20,920,091	23,320,954	22,669,049	23,240,083	23,835,443	25,258,077	25,014,670	23,024,492	23,066,635
General Service 50 to 4999 kW	Cust/Conn	45	53	54	54	59	60	61	62	62
	kWh	61,343,551	69,455,133	67,788,854	64,996,033	68,607,925	67,692,411	66,838,929	68,125,506	68,250,201
	kW	158,301	187,416	186,569	181,724	190,019	195,066	191,782	189,205	189,552
Unmetered Scattered Load	Cust/Conn	13	13	13	13	14	14	12	13	13
	kWh	559,426	571,748	585,041	589,141	619,395	631,477	644,042	561,768	566,996
Sentinel Lighting	Cust/Conn	29	27	26	26	26	26	26	25	25
	kWh	39,009	36,405	35,563	35,581	35,485	35,485	35,152	33,332	33,332
	kW	101	101	99	99	99	98	98	92	92
Street Lighting	Cust/Conn	1,716	1,758	1,802	1,826	1,845	1,845	1,854	1,872	1,890
	kWh	569,977	520,136	517,704	525,998	532,299	530,327	534,834	539,188	544,453
	kW	1,520	1,436	1,429	1,445	1,467	1,467	1,472	1,486	1,501
Total	**Cust/Conn**	**8,668**	**8,773**	**8,923**	**9,084**	**9,215**	**9,325**	**9,366**	**9,479**	**9,593**
	kWh	**128,276,950**	**140,472,767**	**137,474,662**	**138,883,589**	**143,567,973**	**144,326,883**	**142,192,699**	**139,058,353**	**139,321,298**
	kW	**159,922**	**188,954**	**188,096**	**183,268**	**191,585**	**196,631**	**193,352**	**190,784**	**191,145**

3.2.13 INCORPORATION OF CDM

CWH has not included any CDM savings nor is it seeking approval to use LRAMVA for new CDM activities at this time.