BLUEWATER POWER DISTRIBUTION CORPORATION

EXHIBIT 3

LOAD FORECAST

EB-2022-0016

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3.1 LOAD FORECASTS

This exhibit includes evidence on Bluewater's forecast of billing determinants (customers, energy, and demand) and variance analyses related to those items.

Bluewater engaged Elenchus Research Associates ("Elenchus") to complete the 2023 Test Year load forecast.

Population and Load Trends

Bluewater is comprised of six separate geographic areas in Lambton County with the majority of the customers located in the City of Sarnia. The breakdown of customers by municipality is detailed in Table 1.

Table 1: Customer Locations

Municipality	Percent of Customers (%)
City of Sarnia	85.4
Town of Petrolia	7.3
Village of Point Edward	3.0
Township of Warwick - Watford	2.1
Township of Brooke-Alvinston	1.2
Village of Oil Springs	1.0

The City of Sarnia has experienced a low growth level of 0.6% between the Census years of 2016 and 2021[1], as detailed in the Census information contained in Table 2. Lambton County (which includes Sarnia

[1] Statistics Canada. 2022. (table). *Census Profile*. 2021 Census of Population. Statistics Canada Catalogue no. 98-316-X2021001. Ottawa. Released September 21, 2022.
https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E (accessed October 19, 2022).

and all other municipalities served by Bluewater) has experienced a growth level of twice that of Sarnia at 1.2%[2]. Ontario has grown by 5.8%[3], which is almost 10 times the growth level of Sarnia and 5 times that of Lambton County.

Table 2: Census Population Data

	Sarnia	Lambton County	Ontario
Population in 2016	71,594	128,154	13,448,494
Population in 2021	72,047	126,638	14,223,942
Population percentage change, 2016 to 2021 (%)	0.6	1.2	5.8

This trend in stagnant population levels in Bluewater's service territory aligns with the customer growth forecasted.

Sarnia has a large industrial customer base centered on the refining and petrochemical industry located in the south of the city, referred to as 'Chemical Valley.' "These industrial complexes are the heart of Sarnia's infrastructure and economy. They directly employ nearly 8,000 and contribute to almost 45,000 additional jobs in the area."[4] Given the large industrial base, a significant portion of Bluewater's load comes from rate classes other than residential.

As further discussed in Exhibit 1's Business Plan, a significant portion of the oil refined in Chemical Valley is delivered through Enbridge's pipeline Line 5, which runs through the Straits of Mackinac in Michigan. There is currently an ongoing legal battle over Michigan's direction to Enbridge to cease the pipeline's operations. "The Ontario government believes 4,900 jobs in Sarnia, a city of 71,500, are in jeopardy if the line is shut down next week, but Bradley said there's a broader economic impact in his city."[5]

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[2] Statistics Canada. 2022. (table). *Census Profile*. 2021 Census of Population. Statistics Canada Catalogue no. 98-316-X2021001. Ottawa. Released September 21, 2022.
https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E (accessed October 19, 2022).

[3] Statistics Canada. 2022. (table). *Census Profile*. 2021 Census of Population. Statistics Canada Catalogue no. 98-316-X2021001. Ottawa. Released September 21, 2022.
https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E (accessed October 19, 2022).

[4] Wikipedia contributors, "Sarnia," *Wikipedia, The Free Encyclopedia,* https://en.wikipedia.org/w/index.php?title=Sarnia&oldid=1116128846 (accessed October 19, 2022).

[5] As clock ticks down on Enbridge's Line 5, anxiety grows in Sarnia and Michigan | Financial Post

It is difficult to estimate what the impact of shutting down Line 5 may be on Bluewater, or when and if such an event will occur. This potential impact has not been reflected in the current load forecast. If in the event it does occur, Bluewater expects it will have a significant impact on the number of industrial, commercial, and residential customers in Bluewater's service territory, as well as a significant impact on the load forecasts that form part of this application..

3.1.1 Multivariate Regression Model

Elenchus prepared the Weather Normalized Distribution System Load Forecast (Attachment 3-1) on behalf of Bluewater. The Load Forecast Analysis is filed in live Excel format.

Bluewater has used weather normalized forecasts in its determination of load for those rate classes that are weather sensitive. The weather sensitive rate classes are Residential, General Service <50 kW and General Service 50 to 999 kW. The remaining rate classes, being General Service 1,000 to 4,999 kW ("Intermediate"), Large Use, Street Lighting, Sentinel Lighting and Unmetered Scattered Load are not considered weather sensitive and the forecasts for those rate classes are based on consumption trends over the last ten years.

Consumption for Residential, GS<50, GS>50, Intermediate, and Large Use classes were forecast with multivariate regressions. Regression models were chosen in order to utilize the most recent historical consumption and weather data, and allows for the estimation of the statistical relationship between consumption, weather, and other variables that affect monthly consumption. In general, this is a more rigorous approach than using average use per customer or a single regression equation for wholesale purchases.

The methodology uses actual unadjusted data for 2012 to 2021, which is then modeled through separate multiple regression equations to determine a weather normalized forecast for 2022 and 2023 for the weather sensitive classes. Bluewater has adopted the most recent 10-year monthly degree day average as the definition of weather normal.

The load forecast report provides details on the regression models including all variables and assumptions used. The report provides an explanation on the weather normalization.

3.2 ACCURACY OF LOAD FORECAST AND VARIANCE ANALYSES

The OEB Chapter 2 Appendices Tab "App.2-IB Load_Forecast_Analysis" has been completed and submitted in this Application in live Excel format. With the assistance of the OEB, the model was amended to add historical years 2013-2017. Bluewater amended the tab override the auto-populated data with the load forecast data and include a variance for Customers/Devices, Consumption (Actual), and Demand (Actual) between 2017-2020, all of which are immaterial.

Bluewater's year-over-year variance analysis for customers, consumption, and demand (based on billing determinants) is shown below. Bluewater has considered variances at or over 5% to be considered "major changes" for the purposes of section 2.3.2 of the Filing Guidelines.

The following tables provide year-over-year variances for customers or devices and the relevant volumetric billing determinant (kWh or kW). Customer/device counts are year average (annual average of 12 months in the year).

Table 3: 2013 Board Approved vs. 2013 Actual

	Customers/Devices			Volumetric			Volumetric Difference
Rate Class	2013 Approved	2013 Actual	Diff.	2013 Approved	2013 Actual	kWh / kW	
Residential	32,122	32,002	-120	256,986,232	255,389,582	kWh	-1,596,650
GS < 50 kW	3,544	3,472	-72	98,884,257	103,284,259	kWh	4,400,002
GS > 50 kW	438	428	-10	621,654	622,926	kW	1,272
Intermediate	12	13	1	334,928	346,643	kW	11,715
Large User	3	3	0	398,329	396,800	kW	-1,529
Street Light	10,140	10,030	-111	24,522	24,351	kW	-171
Sen. Light	445	428	-17	1,450	1,313	kW	-137
USL	260	262	2	2,214,914	2,183,026	kWh	-31,888
Total	**46,964**	**46,636**	**-328**	**997,089,183**	**1,006,121,332**	**kWh**	**9,032,149**

All customer/device and volumetric variances between 2013 Approved and 2013 Actuals are within 5% except Sentinel Light kW volumes, which were 9.4% lower than Approved. Sentinel Light kW was lower than approved because Sentinel Light devices declined and demand per customer declined in 2013. Overall, variances reflect differences between forecast customer counts and loads and actual figures.

Table 4: 2013 Actual vs. 2014 Actual

	Customers/Devices			Volumes			Volumetric Difference
Rate Class	**2013 Actual**	**2014 Actual**	**Diff.**	**2013 Actual**	**2014 Actual**	**kWh / kW**	
Residential	32,002	32,139	137	255,389,582	248,491,220	kWh	-6,898,361
GS < 50 kW	3,472	3,495	23	103,284,259	103,923,431	kWh	639,172
GS > 50 kW	428	393	-35	622,926	607,208	kW	-15,718
Intermediate	13	12	-1	346,643	359,107	kW	12,464
Large User	3	3	0	396,800	404,064	kW	7,264
Street Light	10,030	10,051	21	24,351	21,697	kW	-2,654
Sen. Light	428	418	-10	1,313	1,278	kW	-35
USL	262	262	0	2,183,026	2,203,828	kWh	20,802
Total	**46,636**	**46,772**	**136**	**1,006,121,332**	**993,873,459**	**kWh**	**-12,247,873**

General Service > 50 kW customer counts declined by 35 (8.2%) mostly due to a reclassification of General Service Customers to General Service < 50 kW. Street Lighting demand declined by 2,654 kW (10.9%) as Bluewater began its LED conversion. Lower Residential consumption and lower total consumption are primarily due to lower cooling loads, as the CDD was 31.3% lower in 2014 than 2013.

Table 5: 2014 Actual vs. 2015 Actual

	Customers/Devices			Volumes			
Rate Class	**2014 Actual**	**2015 Actual**	**Diff.**	**2014 Actual**	**2015 Actual**	**kWh / kW**	**Volumetric Difference**
Residential	32,139	32,277	138	248,491,220	247,531,815	kWh	-959,405
GS < 50 kW	3,495	3,497	3	103,923,431	104,997,600	kWh	1,074,170
GS > 50 kW	393	377	-16	607,208	582,473	kW	-24,735
Intermediate	12	12	0	359,107	346,802	kW	-12,305
Large User	3	3	0	404,064	400,651	kW	-3,413
Street Light	10,051	10,013	-38	21,697	17,287	kW	-4,410
Sen. Light	418	412	-6	1,278	1,254	kW	-24
USL	262	262	1	2,203,828	2,211,250	kWh	7,422
Total	**46,772**	**46,853**	**81**	**993,873,459**	**985,863,059**	**kWh**	**-8,010,400**

Street Light demand continued to decline in 2015 (-4,410 or 20.3%) as Bluewater continued its LED conversion program. All other variances are within 5%. The majority of the decline in total consumption is caused by the 4.1% reduction in GS > 50 kW customer counts and loads.

Table 6: 2015 Actual vs. 2016 Actual

	Customers/Devices			Volumes			
Rate Class	**2015 Actual**	**2016 Actual**	**Diff.**	**2015 Actual**	**2016 Actual**	**kWh / kW**	**Volumetric Difference**
Residential	32,277	32,434	158	247,531,815	254,829,615	kWh	7,297,800
GS < 50 kW	3,497	3,475	-22	104,997,600	103,858,081	kWh	-1,139,520
GS > 50 kW	377	373	-4	582,473	575,501	kW	-6,973
Intermediate	12	11.6	-0.4	346,802	320,386	kW	-26,416
Large User	3.0	3.4	0.4	400,651	436,453	kW	35,802
Street Light	10,013	10,018	5	17,287	13,686	kW	-3,601
Sen. Light	412	407	-5	1,254	1,205	kW	-49
USL	262	261	-1	2,211,250	2,221,667	kWh	10,417
Total	**46,853**	**46,984**	**130**	**985,863,059**	**1,012,644,400**	**kWh**	**26,781,341**

An Intermediate customer was reclassified to the Large User class in Q3 2016 which led to a 8.9% increase in Large User demand and -7.6% decline in Intermediate demand in 2016. The Large Use increase is partially caused by an increase in Oil & Gas GDP, which is a significant industry in Sarnia. Street Light demand continued to decline in 2016 (-3,601 or 20.8%) as Bluewater continued its LED conversion program. Total consumption was 2.7% higher in 2016 than 2015 because of an increase in the Residential customer count (2.9%) and a significant increase in cooling loads (CDD increased by 46.2%).

Table 7: 2016 Actual vs. 2017 Actual

	Customers/Devices			**Volumes**			**Volumetric Difference**
Rate Class	**2016 Actual**	**2017 Actual**	**Diff.**	**2016 Actual**	**2017 Actual**	**kWh / kW**	
Residential	32,434	32,605	170	254,829,615	243,695,248	kWh	-11,134,367
GS < 50 kW	3,475	3,478	3	103,858,081	99,503,004	kWh	-4,355,076
GS > 50 kW	373	382	9	575,501	560,226	kW	-15,275
Intermediate	11.6	11.0	-0.6	320,386	281,957	kW	-38,429
Large User	3.4	4.0	0.6	436,453	479,867	kW	43,414
Street Light	10,018	10,042	24	13,686	11,695	kW	-1,991
Sen. Light	407	391	-16	1,205	1,324	kW	119
USL	261	258	-3	2,221,667	2,156,982	kWh	-64,685
Total	**46,984**	**47,171**	**188**	**1,012,644,400**	**973,706,352**	**kWh**	**-38,938,048**

With a full year of the large reclassified customer within the Large User class, Large User demand increased by 9.9% and Intermediate demand decreased by 12%. The LED conversion continued in 2017 with a 14.5% decrease in Street Light demand. Sentinel Light demand increased by 9.8% in 2017 as demand per customer increased. Total consumption declined by 3.8% as weather-related loads declined with a 23.7% reduction in CDD.

Table 8: 2017 Actual vs. 2018 Actual

	Customers/Devices			Volumes			Volumetric Difference
Rate Class	2017 Actual	2018 Actual	Diff.	2017 Actual	2018 Actual	kWh / kW	
Residential	32,605	32,755	151	243,695,248	259,006,064	kWh	15,310,816
GS < 50 kW	3,478	3,468	-10	99,503,004	101,399,120	kWh	1,896,115
GS > 50 kW	382	389	7	560,226	559,688	kW	-538
Intermediate	11	11	0	281,957	279,318	kW	-2,639
Large User	4	4	0	479,867	486,459	kW	6,592
Street Light	10,042	10,068	26	11,695	10,173	kW	-1,521
Sen. Light	391	385	-7	1,324	1,302	kW	-22
USL	258	256	-2	2,156,982	2,052,963	kWh	-104,019
Total	**47,171**	**47,336**	**165**	**973,706,352**	**988,426,613**	**kWh**	**14,720,261**

Residential consumption increased by 6.3% in 2018 due primarily to cooler winter months (3,815 HDD in 2018 vs 3,406 HDD in 2017) and a warmer summer (417 CDD in 2018 vs 335 CDD in 2017). General Service < 50 kW consumption also increased despite a decline in customer counts. The LED conversion continued in 2018 with a 13.0% decrease in Street Light demand. The variance in total system consumption is due to the weather-related differences from 2017, particularly to the Residential and GS < 50 kW classes.

Table 9: 2018 Actual vs. 2019 Actual

	Customers/Devices			Volumes			Volumetric Difference
Rate Class	2018 Actual	2019 Actual	Diff.	2018 Actual	2019 Actual	kWh / kW	
Residential	32,755	32,862	106	259,006,064	251,122,549	kWh	-7,883,515
GS < 50 kW	3,468	3,485	17	101,399,120	101,723,563	kWh	324,443
GS > 50 kW	389	372	-17	559,688	528,420	kW	-31,268
Intermediate	11	11	0	279,318	265,775	kW	-13,543
Large User	4	4	0	486,459	477,956	kW	-8,503
Street Light	10,068	10,100	33	10,173	9,620	kW	-553
Sen. Light	385	385	1	1,302	1,302	kW	0
USL	256	257	0	2,052,963	2,202,858	kWh	149,895
Total	**47,336**	**47,476**	**140**	**988,426,613**	**974,925,242**	**kWh**	**-13,501,371**

The General Service > 50 kW customer count declined by 4.4% in 2019 due to a reclassification of 17 customers to the General Service < 50 kW class. There was a corresponding 5.6% decrease to General Service < 50 kW loads. Street Light demand continued to decline in 2019. USL consumption increased in 2019 by 7.3% as consumption per device increased. Total system consumption declined by 1.4%, which is partially caused by lower weather-related loads (-24.5% reduction in CDD).

Table 10: 2019 Actual vs. 2020 Actual

	Customers/Devices			Volumes			Volumetric Difference
Rate Class	2019 Actual	2020 Actual	Diff.	2019 Actual	2020 Actual	kWh / kW	
Residential	32,862	32,990	128	251,122,549	270,338,602	kWh	19,216,053
GS < 50 kW	3,485	3,490	5	101,723,563	94,820,550	kWh	-6,903,013
GS > 50 kW	372	369	-4	528,420	511,401	kW	-17,019
Intermediate	11	10	-1	265,775	241,408	kW	-24,367
Large User	4	4	0	477,956	461,493	kW	-16,463
Street Light	10,100	10,136	36	9,620	9,569	kW	-51
Sen. Light	385	371	-15	1,302	1,196	kW	-106
USL	257	253	-3	2,202,858	2,209,114	kWh	6,256
Total	**47,476**	**47,623**	**147**	**974,925,242**	**956,918,930**	**kWh**	**-18,006,312**

Loads in 2020 were materially impacted by the COVID-19 pandemic. Residential consumption increased as more people worked from home and generally spent more time at home in accordance with public health recommendations and mandates. Additionally, cooling load increased from 2019 to 2020 (367 CDD in 2020 vs. 315 CDD in 2019). The General Service < 50 kW, General Service > 50 kW, Intermediate, and Large Use rate classes reduced loads in 2020 as a result of COVID-19 and corresponding economic impacts. The Intermediate class lost 1 customer, moving from 11 customers to 10 customers. The Sentinel Light device count and demand also declined in 2020. The reduction in commercial and industrial loads was greater than the increase in Residential loads resulting in a 1.8% overall decline in consumption.

Table 11: 2020 Actual vs. 2021 Actual

	Customers/Devices			Volumes			Volumetric Difference
Rate Class	**2020 Actual**	**2021 Actual**	**Diff.**	**2020 Actual**	**2021 Actual**	**kWh / kW**	
Residential	32,990	33,113	123	270,338,602	275,475,848	kWh	5,137,246
GS < 50 kW	3,490	3,459	-31	94,820,550	98,943,526	kWh	4,122,976
GS > 50 kW	369	372	4	511,401	522,129	kW	10,728
Intermediate	10	9	-1	241,408	245,050	kW	3,642
Large User	4	4	0	461,493	471,315	kW	9,823
Street Light	10,136	10,161	25	9,569	9,338	kW	-231
Sen.Light	371	367	-4	1,196	1,187	kW	-8
USL	253	243	-10	2,209,114	2,181,431	kWh	-27,683
Total	**47,623**	**47,728**	**105**	**956,918,930**	**957,813,268**	**kWh**	**894,338**

Variances in 2021 loads relative to 2020 generally reflect a partial reversal of 2020 COVID-related impacts. The Intermediate class lost another customer in 2021. Though consumption on a class by class basis changed from 2020 to 2021, total system consumption was roughly the same from 2020 to 2021 (0.1% increase).

Table 12: 2021 Actual vs. 2022 Bridge Year

	Customers/Devices			Volumes			Volumetric Difference
Rate Class	2021 Actual	2022 Bridge	Diff.	2021 Actual	2022 Bridge	kWh / kW	
Residential	33,113	33,251	138	275,475,848	269,879,837	kWh	-5,596,011
GS < 50 kW	3,459	3,489	30	98,943,526	102,439,019	kWh	3,495,493
GS > 50 kW	372	360	-13	522,129	531,362	kW	9,234
Intermediate	9	9	0	245,050	226,758	kW	-18,292
Large User	4	4	0	471,315	470,273	kW	-1,042
Street Light	10,161	10,177	16	9,338	9,133	kW	-205
Sen. Light	367	359	-8	1,187	1,175	kW	-13
USL	243	241	-2	2,181,431	2,162,262	kWh	-19,169
Total	**47,728**	**47,889**	**161**	**957,813,268**	**964,438,597**	**kWh**	**6,625,330**

The 2022 Bridge Year forecast includes a continuation of the return to normal loads as he impacts of COVID-19 ease. General Service > 50 kW customer counts decline by 3.4% due to reclassifications in 2022. Intermediate demand is forecast to decline by 7.5%, primarily due to a post-CFF PSUP project. Though weather impacts or forecast to decline in 2022 with normalized weather, this reduction is more than offset by forecast increases caused by easing of COVID impacts.

Table 13: 2022 Bridge Year vs. 2023 Test Year

	Customers/Devices			Volumes			Volumetric Difference
Rate Class	2022 Bridge	2023 Test	Diff.	2022 Bridge	2023 Test	kWh / kW	
Residential	33,251	33,390	139	269,879,837	264,890,809	kWh	-4,989,028
GS < 50 kW	3,489	3,487	-2	102,439,019	103,734,059	kWh	1,295,040
GS > 50 kW	360	354	-6	531,362	522,093	kW	-9,270
Intermediate	9	8	-1	226,758	219,591	kW	-7,167
Large User	4	4	0	470,273	474,203	kW	3,930
Street Light	10,177	10,193	16	9,133	9,147	kW	14
Sen. Light	359	351	-8	1,175	1,149	kW	-25
USL	241	342	101	2,162,262	2,201,349	kWh	39,088
Total	**47,889**	**48,128**	**239**	**964,438,597**	**955,799,596**	**kWh**	**-8,310,303**

Changes from the 2022 Bridge Year to 2023 Test Year reflect the results of the Load Forecast model. The impacts of COVID are assumed to continue to subside. Bluewater is aware of one Intermediate customer that will be reclassified to General Service > 50 kW at the start of 2023, and so the forecast is based on monthly consumption of the 8 customers remaining in the Intermediate class.

The customer counts of all other rate classes are based on 2012-2021 average growth trends. The same "normal weather" profile is used in the 2022 and 2023 forecasts so volumetric differences do not reflect any weather-related difference. Overall declining consumption is due to the reduction in COVID impacts for the Residential class and the material reduction in consumption of one Intermediate customer.

Traffic light device counts and consumption have historically been understated. Traffic lights were counted as a single customer and monthly consumption has been understated by 3,942 kWh. Bluewater will implement the change in the 2023 Test Year. Consumption in 2023 has been forecasted based on adjusted 2021 consumption per customer calculations that include the additional consumption that will be incorporated in 2023 and the corrected device counts.

ATTACHMENT 3 – 1

LOAD FORCAST REPORT

EB-2022-0016

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Weather Normalized Distribution System Load Forecast: 2023 Cost of Service

Report prepared by
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Elenchus Research Associates Inc.

Prepared for:
Bluewater Power Distribution Corp.

30 September 2022
Revised 15 November 2022

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1 INTRODUCTION

This report outlines the results of, and methodology used to derive, the weather normal load forecast prepared for Bluewater Power Distribution Corporation (“Bluewater”) for its Cost of Service application for 2023 rates.

The regression equations used to normalize and forecast Bluewater’s weather sensitive load use monthly heating degree days and cooling degree days as measured at Environment Canada’s Sarnia Climate weather station to take into account temperature sensitivity. Bluewater typically experiences relatively large cooling load in the summer and smaller heating loads in the winter so its peak load is generally in the summer. Environment Canada defines heating degree days and cooling degree days as the difference between the average daily temperature and 18°C for each day (below for heating, above for cooling). Heating and cooling degree days with base temperatures other than 18°C have also been considered.

To isolate the impact of CDM, persisting CDM as measured by the IESO is added back to rate class consumption to simulate the rate class consumption had there been no CDM program delivery. This is labelled as “Actual No CDM” throughout the model. The effect is to remove the impact of CDM from any explanatory variables, which may capture a trend, and focus on the external factors. A weather normalized forecast is produced first based on no CDM delivery, and then persisting CDM savings of historic programs are subtracted off to reflect the actual normal forecast.

CDM data beyond 2018 is based on limited data in the IESO Participant and Cost Report and additional project-specific data provided by Bluewater. As per the updated CDM Guidelines, forecast CDM is based on a forecast of Bluewater’s share of provincial energy savings.

While statistical regression is appropriate for estimating a relationship between explanatory variables and energy use, in the case of CDM, an independent measurement is available providing a greater level of accuracy than could be obtained through regression.

Overall economic activity also impacts energy consumption. There is no known agency that publishes monthly economic accounts on a regional basis for Ontario. However, regional employment levels are available. Specifically, the monthly full-time equivalent (FTE) employment levels for London and Ontario, as reported in Statistics Canada’s Monthly Labour Force Survey[1] are considered. Economic data for Sarnia is unavailable

[1] Statistics Canada Table 14-10-0380-01

from Statistics Canada so London is used as a proxy as it is the closest economic region with data available. Ontario GDP is available from Ontario Economic Accounts[2] on a quarterly basis and Overall GDP is available from Statistics Canada on an annual basis.[3] The GDP of specific industries relevant to Sarnia's service territories are also considered.

In order to isolate demand determinants at the class specific level, equations to weather normalize and forecast kWh consumption for the Residential, GS < 50 kW, GS > 50 kW, and Large Use classes have been estimated.

In addition to the weather and economic variables, a time trend variable, number of days and number of working days in each month, number of customers, and month of year variables have been examined for all weather-sensitive rate classes. More details on the individual class specifications are provided in the next section.

A range of COVID variables were considered to account for the impacts triggered by the COVID-19 pandemic. These variables have been included in load forecasts used to set electricity distribution rates in Ontario.[4] The extent to which the consumption since March 2020 differed from typical consumption was found to be related to the weather variables in those months. A set of COVID/weather interaction variables were considered to capture the incremental consumption caused by people working from home and generally staying at home due to lockdowns. These variables, "HDD COVID" and "CDD COVID" are equal to the relevant HDD and CDD variables since March 2020, and 0 in all earlier months. The coefficients reflect incremental heating and cooling load consumed as people stayed home during the pandemic. These variables continue to December 2021 but are reduced to 50% of HDD and CDD in all months in 2022 and to 25% in 2023.

COVID flag variables were tested and found to be statistically significant for the General Service < 50 kW, General Service > 50 kW, Intermediate, and Large Use classes. There are three COVID flag variables considered: "COVID", "COVID_AM", and "COVID_2020". The "COVID" variable is equal to 0 in all months prior to March 2020 and 1 in all months since March 2020. The "COVID_AM" variable is equal to 0 in all months prior to March 2020, equal to 0.5 in March 2020, equal to 1 in April and May 2020, and 0.5 in each month from June 2020 to December 2021. The "COVID_AM" variable considers the incremental impact in the first few months of the pandemic, with lower impacts after May 2020. The "COVID_2020" variable is equal to 0 in all months prior to March 2020, equal to 0.5 in March 2020, equal to 1 in April and May 2020, equal to 0.5 in June 2020, and 0 in each

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[2] Ontario Economic Accounts (https://data.ontario.ca/dataset/ontario-economic-accounts)

[3] Statistics Canada Table 36-10-0402-01

[4] Grimsby Power Inc. (EB-2021-0027) and Milton Hydro Distribution Inc. (EB-2022-0049). The variables are included in the load forecasts used in two Cost of Service proceedings that are ongoing as of the date of this report: Kingston Hydro (EB-2022-0044) and EPCOR Electricity Distribution Ontario Inc. (EB-2022-0028).

month thereafter. The “COVID_2020” variable accounts for the impact of COVID in the first few months of the pandemic without any persisting impacts.[5] Each flag variable was tested for each class and the variable showing the strongest statistical results was used in each regression model. The “COVID_AM” variable is used for the General Service < 50 kW and Large Use rate classes and the “COVID 2020” variable is used for the General Service > 50 kW and Intermediate rate classes. The “COVID” and “COVID_AM” variables continue to December 2021 but are reduced to 50% of HDD and CDD in all months in 2022 and to 25% in 2023. These adjustment factors reflect the ongoing declining consumption levels triggered by the various calendar variables such as the number of days in the month, binary month variables (equal to 1 in the respective month and 0 in all other months), and seasonal binary variables were considered.

Bluewater has experienced many reclassifications of its Intermediate and Large Use customers. The Intermediate class customer count declined from 13 in 2012 to 8 in 2023 and the Large Use class increased from 3 to 4 over this period. For the purposes of forecasting 2023 consumption for these classes Elenchus used the data from only the customers known to be in the classes in 2023, excluding customers that have been reclassified or ceased operations in the 2012-2021 period.

Finally, for classes with demand charges, an annual kW to kWh ratio is calculated using actual observations for each historical year and applied to the normalized kWh to derive a weather normal kW observation.

[5] This variable does not continue to the Bridge Year of Test Year but is included to account for abnormal consumption at the start of the pandemic that is not precisely reflected in any other variable. Without this variable, the abnormal consumption levels in those months would skew the coefficients of the remaining variables. If temporarily lower consumption is not explained by any variables the model will inappropriately forecast lower consumption on an ongoing basis. For this reason, Elenchus anticipates it will continue to use COVID variables when there are no COVID-related amounts in forecast years.

1.1 SUMMARIZED RESULTS

The following table summarizes the historic and forecast kWh for 2013 to 2023:

Normal Forecast

kWh	2013 Actual	2014 Actual	2015 Actual	2016 Actual	2017 Actual	2018 Actual
Residential	255,389,582	248,491,220	247,531,815	254,829,615	243,695,248	259,006,064
GS < 50	103,284,259	103,923,431	104,997,600	103,858,081	99,503,004	101,399,120
GS > 50	222,721,188	216,401,666	210,203,757	207,887,227	196,589,569	198,076,032
Intermediate	161,171,663	159,033,210	158,080,305	156,593,665	137,456,443	136,386,985
Large User	251,680,101	255,196,632	255,903,896	281,637,471	289,478,994	287,387,432
Street Light	9,144,166	8,086,583	6,427,057	5,119,606	4,349,789	3,664,818
Sentinel Light	547,347	536,887	507,380	497,069	476,322	453,200
USL	2,183,026	2,203,828	2,211,250	2,221,667	2,156,982	2,052,963
Total	1,006,121,332	993,873,459	985,863,059	1,012,644,400	973,706,352	988,426,613

kWh	2019 Actual	2020 Actual	2021 Actual	2022 Forecast	2023 Forecast
Residential	251,122,549	270,338,602	275,475,848	270,291,183	265,592,217
GS < 50	101,723,564	94,820,550	98,943,526	103,387,625	105,317,729
GS > 50	193,322,393	182,593,246	185,117,331	192,603,165	192,112,284
Intermediate	131,667,230	121,864,255	126,088,597	119,342,811	118,382,643
Large User	290,955,053	281,204,845	266,221,942	280,142,331	282,898,876
Street Light	3,457,006	3,449,208	3,351,425	3,356,657	3,361,898
Sentinel Light	474,594	439,110	433,168	423,796	414,626
USL	2,202,857	2,209,114	2,181,431	2,162,262	2,201,349
Total	974,925,246	956,918,930	957,813,268	971,709,830	970,281,623

Table 1 kWh Forecast by Class

The following table summarizes the 2023 CDM Adjusted kWh Load Forecast. Details for this calculation can be found in Schedule 6 of this report.

CDM Adjusted

kWh	2023 Weather Normal Forecast	CDM Adjustment	2023 CDM Adjusted Forecast
Residential	265,592,217	701,408	264,890,809
GS < 50	105,317,729	1,583,670	103,734,059
GS > 50	192,112,284	6,069,382	186,042,901
Intermediate	118,382,643	5,425,200	112,957,443
Large User	282,898,876	702,366	282,196,510
Street Light	3,361,898	0	3,361,898
Sentinel Light	414,626	0	414,626
USL	2,201,349	0	2,201,349
Total	970,281,623	14,482,027	955,799,596

Table 2 CDM Adjusted kWh Forecast

The following table summarizes the historic and forecast kW for 2013 to 2023:

Normal Forecast

kW	2013 Actual	2014 Actual	2015 Actual	2016 Actual	2017 Actual	2018 Actual
GS > 50	622,926	607,208	582,473	575,501	560,226	559,688
Intermediate	346,643	359,107	346,802	320,386	281,957	279,319
Large User	396,800	404,064	400,651	436,453	479,867	486,459
Street Light	24,351	21,697	17,287	13,686	11,695	10,174
Sentinel Light	1,313	1,278	1,254	1,205	1,324	1,302
Total	1,392,033	1,393,354	1,348,468	1,347,231	1,335,069	1,336,941

kW	2019 Actual	2020 Actual	2021 Actual	2022 Forecast	2023 Forecast
GS > 50	528,420	511,401	522,129	540,503	539,125
Intermediate	265,773	241,408	245,050	232,004	230,138
Large User	477,955	461,493	471,315	470,751	475,383
Street Light	9,621	9,569	9,338	9,133	9,147
Sentinel Light	1,299	1,196	1,187	1,175	1,149
Total	1,283,068	1,225,066	1,249,020	1,253,566	1,254,942

Table 3 kW Forecast by Class

The following table summarizes the 2023 CDM Adjusted kW Load Forecast. Details for this calculation can be found at the end of in Schedule 6 of this report.

CDM Adjusted

kW	2023 Weather Normal Forecast	CDM Adjustment	2023 CDM Adjusted Forecast
GS > 50	539,125	17,033	522,093
Intermediate	230,138	10,547	219,591
Large User	475,383	1,180	474,203
Street Light	9,147	0	9,147
Sentinel Light	1,149	0	1,149
Total	1,254,942	28,759	1,226,183

Table 4 CDM Adjusted kW Forecast

The following table summarizes the historic and forecast customer/devices for 2013 to 2023:

Customers / Devices

	2013 Actual	2014 Actual	2015 Actual	2016 Actual	2017 Actual	2018 Actual
Residential	32,002	32,139	32,277	32,434	32,605	32,755
GS < 50	3,472	3,495	3,497	3,475	3,478	3,468
GS > 50	428	393	377	373	382	389
Intermediate	13	12	12	12	11	11
Large User	3	3	3	3	4	4
Street Light	10,030	10,051	10,013	10,018	10,042	10,068
Sentinel Light	428	418	412	407	391	385
USL	262	262	262	261	258	256
Total	46,636	46,772	46,853	46,984	47,171	47,336

Customers / Devices

	2019 Actual	2020 Actual	2021 Actual	2022 Forecast	2023 Forecast
Residential	32,862	32,990	33,113	33,251	33,390
GS < 50	3,485	3,490	3,459	3,489	3,487
GS > 50	372	369	372	360	354
Intermediate	11	10	9	9	8
Large User	4	4	4	4	4
Street Light	10,100	10,136	10,161	10,177	10,193
Sentinel Light	385	371	367	359	351
USL	257	253	243	241	342
Total	47,476	47,623	47,728	47,889	48,128

Table 5 Customer / Device Forecast for 2013-2023

Finally, a summary of billing determinants is provided in Table 6.

Summary

2023	kWh	kW	Customers / Devices
Residential	264,890,809		33,390
GS < 50	103,734,059		3,487
GS > 50		522,093	354
Intermediate		219,591	8
Large User		474,203	4
Street Light		9,147	10,193
Sentinel Light		1,149	351
USL	2,201,349		342
Total	**370,826,218**	**1,226,183**	**48,128**

Table 6 Billing Determinant Summary

1.2 LOAD FACTOR INFLUENCES

Table 7 below provides a summary of Bluewater Power's total system consumption and the key factors that influence its load. HDD and CDD figures represent the differences between actual weather-related loads and 10-year normalized weather-related loads. In addition to weather, the key drivers of changes in Bluewater Power's loads is declining commercial and industrial customer counts, an increase in industrial consumption corresponding to Oil & Gas GDP, and the COVID-19 pandemic beginning in 2020.

Year	Total kWh	kWh Growth	HDD	CDD	Metered Cust.	Metered Customer Growth	Other
2013	1,006,121,332		6.0%	-7.9%	35,917		
2014	993,873,459	-1.2%	15.8%	-36.7%	36,042	0.3%	
2015	985,863,059	-0.8%	3.7%	-15.0%	36,166	0.3%	
2016	1,012,644,400	2.7%	-4.7%	24.3%	36,297	0.4%	Oil & Gas GDP
2017	973,706,352	-3.8%	-5.8%	-5.1%	36,480	0.5%	
2018	988,426,613	1.5%	5.6%	18.1%	36,628	0.4%	
2019	974,925,242	-1.4%	5.0%	-10.8%	36,734	0.3%	
2020	956,918,930	-1.8%	-4.8%	4.0%	36,863	0.4%	COVID
2021	957,813,268	0.1%	-9.0%	15.2%	36,957	0.3%	COVID
Avg. Growth 2013-2021		-0.61%				0.36%	

Table 7 Load Influence Summary

Bluewater Power's consumption has declined by 4.8% since 2013, or 0.61% per year. The decline is primarily due to lower commercial and industrial consumption, which has declined by 8.5% since 2013, or 1.1% per year. This decline is somewhat offset by increasing Residential consumption, which has increased by 7.9%, or 0.95% per year, since 2013.

Year	Residential				GS < 50, GS > 50, Intermediate, Large Use			
	Cust.	Cust. Growth %	kWh	kWh Growth %	Cust.	Cust. Growth %	kWh	kWh Growth %
2013	32,002		255,389,582		3,915		738,857,210	
2014	32,139	0.4%	248,491,220	-2.7%	3,903	-0.3%	734,554,940	-0.6%
2015	32,277	0.4%	247,531,815	-0.4%	3,889	-0.4%	729,185,557	-0.7%
2016	32,434	0.5%	254,829,615	2.9%	3,863	-0.7%	749,976,443	2.9%
2017	32,605	0.5%	243,695,248	-4.4%	3,875	0.3%	723,028,010	-3.6%
2018	32,755	0.5%	259,006,064	6.3%	3,873	-0.1%	723,249,568	0.0%
2019	32,862	0.3%	251,122,549	-3.0%	3,872	0.0%	717,668,238	-0.8%
2020	32,990	0.4%	270,338,602	7.7%	3,873	0.0%	680,482,896	-5.2%
2021	33,113	0.4%	275,475,848	1.9%	3,844	-0.7%	676,371,396	-0.6%
Avg.		0.43%		0.95%		-0.23%		-1.10%

Table 8 Residential and Commercial/Industrial Loads

Consumption increased year-over-year in three years over the past 10 years. Total consumption increases in 2016 and 2018 correspond to the years with the hottest summers (highest CDD cooling loads), and consumption increased in 2021 following material impacts of COVID-19 in 2020. These impacts persisted in 2021 but to a smaller extent. There was also an increase in non-weather consumption in 2016 in line with the increase in Oil & Gas GDP in 2016. Larger consumption declines, such as the 3.8% decline in 2017 and 1.4% decline in 2019, correspond to lower weather related loads.

In addition to declines in commercial and industrial customer counts, consumption of the GS<50 kW, GS > 50 kW, Intermediate, and Large Use per customer have declined, partially due to conservation programs.

2 Class Specific kWh Regression

Consumption for the Residential, GS < 50, GS > 50, Intermediate, and Large Use rate classes were forecast with multivariate regressions. Regressions were not used for the Street Light, Sentinel Light, and USL rate classes as these classes do not exhibit sensitivity to the explanatory variables available for a statistical regression approach.

2.1 Residential

For Residential kWh consumption the equation was estimated using 120 observations from 2012:01-2021:12. Multiple heating degree day and cooling degree day thresholds were considered in the Residential regression. Consumption is relatively stable when the average monthly temperature is between 14°C and 16°C and increases as average temperatures deviate from that range. HDD relative to 14°C and CDD relative to 16°C were found to provide the strongest results. HDD and CDD measures near 14°C and 16°C, respectively, were also considered but found to be less predictive of monthly consumption.

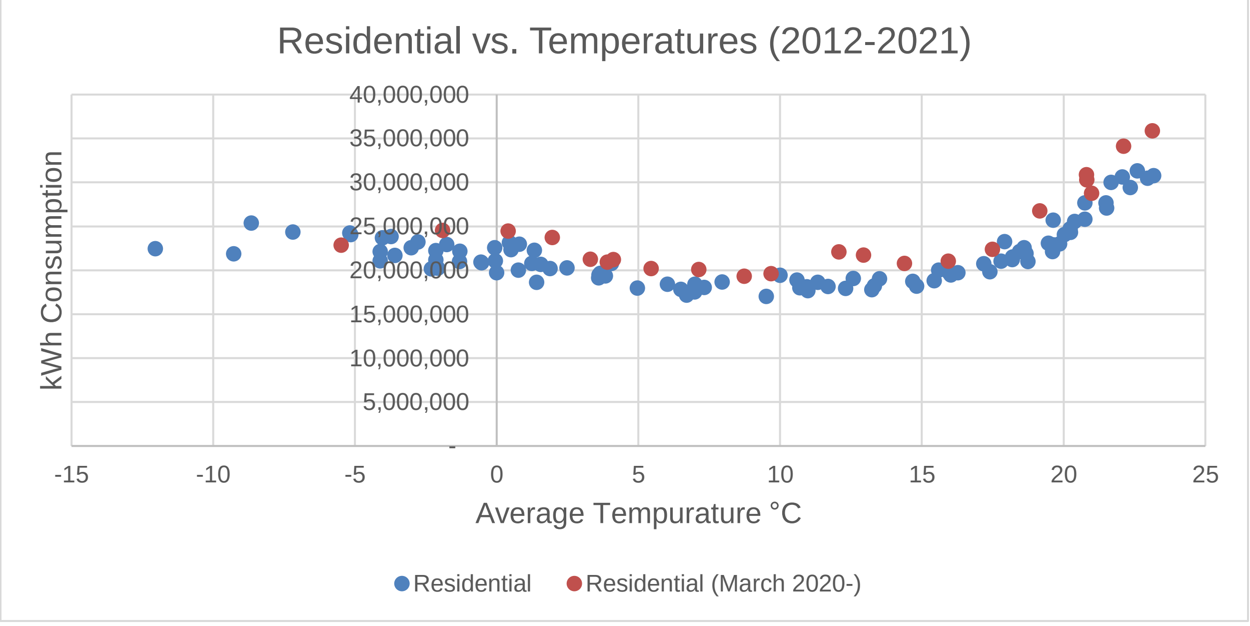

Figure 1 Residential kWh and Average Temperature

In addition to the HDD16 and CDD14 variables, the corresponding COVIDHDD16 and COVIDCDD14 variables were used and found to be statistically significant.

The seasonally adjusted Ontario FTE count, a measure of employment, is used as it was found to be the economic variable with the strongest statistical results. Other economic variables, such as London employment and various GDP measures, were tested but found to be inferior variables.

A shoulder variable, equal to 1 in March, April, May, September, and October and 0 in all other months, is used and found to be statistically significant. A binary December variable, equal to 1 in December and 0 in all other months, was found to be statistically significant. A version of the model without this variable was tested and consumption in December was regularly underestimated so this variable was introduced.

A count of the number of calendar days in the month was also used.

Several other variables were examined and found to not show a statistically significant relationship to energy usage, or a weaker relationship than similar variables that are included. Those included GDP, a time trend variable, and other calendar variables.

A time-series autoregressive model using the Prais-Winsten estimation was used for the Residential class to account for autocorrelation.

The following table outlines the resulting regression model:

Model 1: Prais-Winsten, using observations 2012:01-2021:12 (T = 120) Dependent variable: Res_NoCDM rho = 0.323696				
	coefficient	std. error	t-ratio	p-value
const	(12,119,271)	3,032,547.1	(3.996)	0.00012
HDD14	11,228	560.9	20.018	0.00000
CDD16	62,469	1,937.6	32.241	0.00000
AdjOnt_FTE	1,316	336.6	3.910	0.00016
Dec	678,521	208,515.9	3.254	0.00151
MonthDays	642,636	69,072.0	9.304	0.00000
Shoulder	(756,047)	171,058.2	(4.420)	0.00002
COVIDHDD14	3,562	813.8	4.376	0.00003
COVIDCDD16	23,770	2,250.5	10.562	0.00000
Statistics based on the rho-differenced data				
Mean dependent var	22,136,740	S.D. dependent var	3,755,519	
Sum squared resid	4.44E+13	S.E. of regression	632,169	
R-squared	0.97392	Adjusted R-squared	0.9720	
F(8, 111)	398.863	P-value(F)	0.0000	
rho	-0.0136	Durbin-Watson	2.0088	

Table 9 Residential Regression Model

Using the above model coefficients, we derive the following:

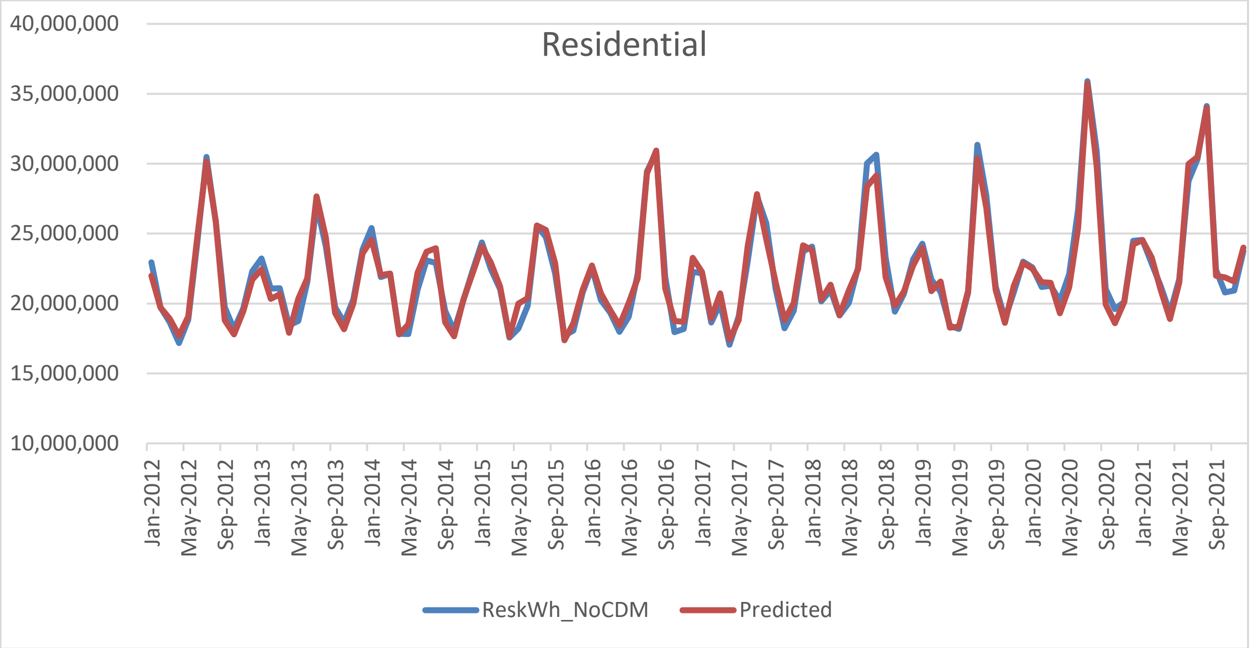

Figure 2 Residential Predicted vs Actual observations

Annual estimates using actual weather are compared to actual values in the table below. Mean absolute percentage error (MAPE) for annual estimates for the period is 1.0%. The MAPE calculated monthly over the period is 2.3%.

Year	Residential kWh CDM Added Back	Predicted	Absolute Error (%)
2012	257,869,306	255,960,565	0.7%
2013	257,847,061	256,935,513	0.4%
2014	252,161,004	253,684,078	0.6%
2015	252,472,940	256,914,231	1.8%
2016	261,879,307	265,341,668	1.3%
2017	255,917,677	259,263,021	1.3%
2018	274,156,481	270,858,352	1.2%
2019	267,147,932	264,919,198	0.8%
2020	286,141,752	279,818,978	2.2%
2021	290,815,366	293,043,200	0.8%
Mean Absolute Percentage Error (Annual)			1.0%
Mean Absolute Percentage Error (Monthly)			2.3%

Table 10 Residential model error

2.2 GS < 50

For the GS < 50 class, the regression equation was estimated using 120 observations from 2012:01-2021:12. Consumption for this class is relatively stable when the average monthly temperature is between 14°C and 16°C and increases as average temperatures deviate from that range. HDD relative to 14°C and CDD relative to 16°C were found to provide the strongest results. HDD and CDD measures near 14°C and 16°C, respectively, were also considered but found to be less predictive of monthly consumption.

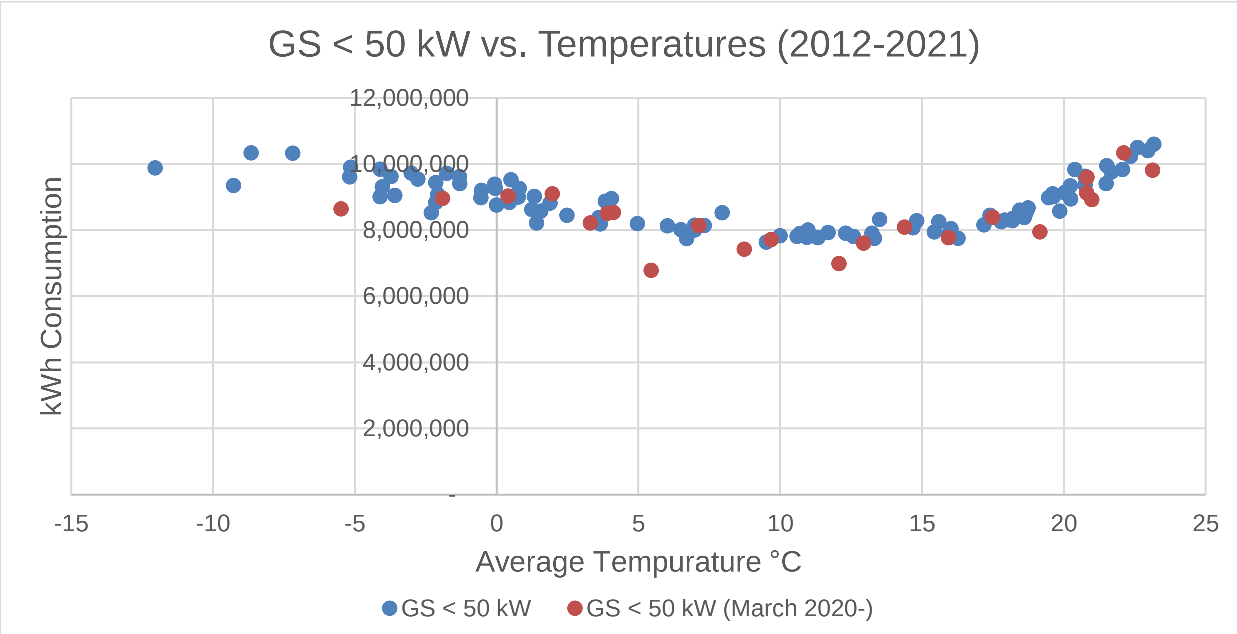

Figure 3 GS<50 kWh and Average Temperature

Seasonally adjusted London FTEs has been included as an indicator of economic activity. Measures for Ontario employment and GDP were also tested but found to be statistically less significant than Ontario GDP.

The COVID_AM variable has been included for this class. This variable is equal to 0 in each month prior to March 2020, 0.5 in March 2020, 1 in April 2020 and May 2020, and 0.5 in each month from June 2020 to December 2021. This variable accounts for the impacts of COVID, while recognizing the impacts in April and May 2020 were more significant than any month thereafter. The value in March 2020 reflects that the impacts of the pandemic on energy consumption began about halfway though the month.

The customer count, time trend, and various calendar variables were tested but found to not have statistically significant relationships to energy usage.

The following table outlines the resulting regression model:

Model 2: Prais-Winsten, using observations 2012:01-2021:12 (T = 120) Dependent variable: GSlt50kW_NoCDM rho = 0.19476				
	coefficient	std. error	t-ratio	p-value
const	4,911,431	661,504.8	7.425	0.00000
HDD14	4,377	188.8	23.191	0.00000
CDD16	15,069	605.7	24.879	0.00000
COVID_AM	(1,031,444)	166,815.0	(6.183)	0.00000
AdjLnd_FTE	9,121	2,683.1	3.399	0.00093
Statistics based on the rho-differenced data				
Mean dependent var	8,745,277	S.D. dependent var	796,572	
Sum squared resid	8.63E+1:	S.E. of regression	273,995	
R-squared	0.88566	Adjusted R-squared	0.8817	
F(4, 115)	210.786	P-value(F)	0.0000	
rho	-0.0530	Durbin-Watson	2.0553	

Table 11 GS < 50 Regression Model

Using the above model coefficients we derive the following:

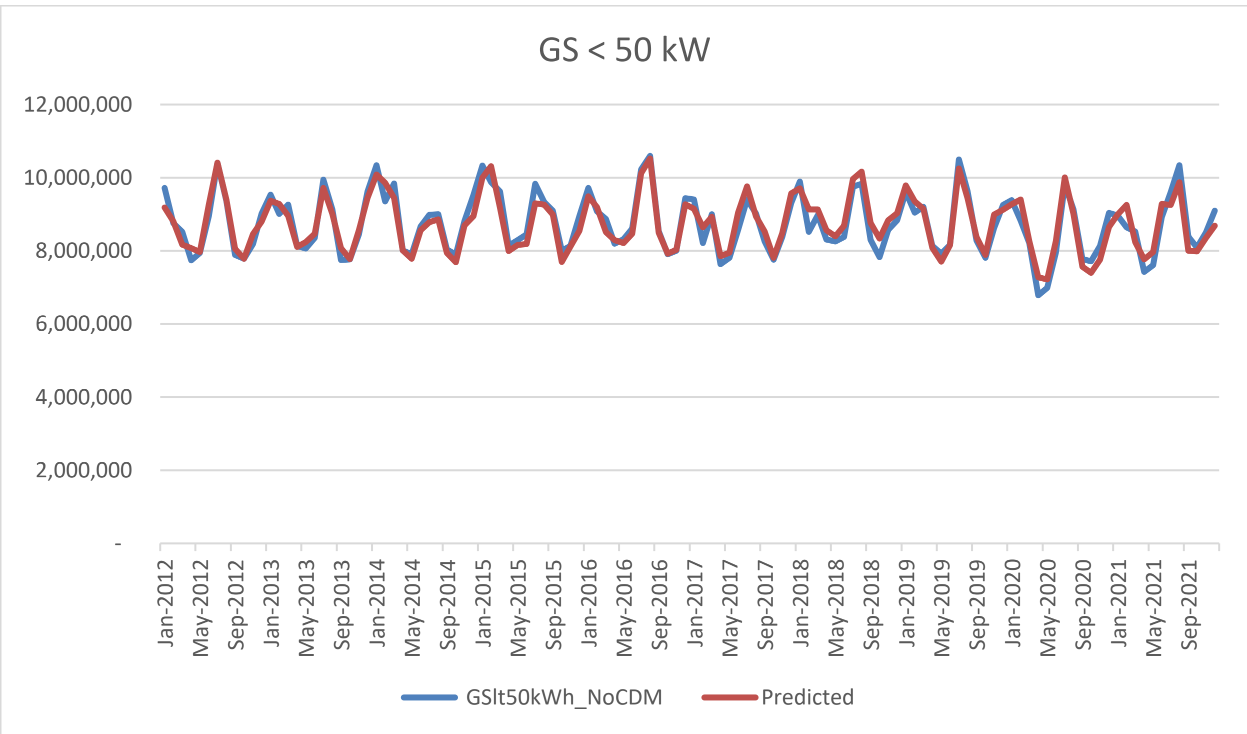

Figure 4 GS < 50 Predicted vs Actual observations

Annual estimates using actual weather are compared to actual values in the table below. Mean absolute percentage error (MAPE) for annual estimates for the period is 1.2%. The MAPE calculated monthly over the period is 2.6%.

	GS<50 kWh CDM Added Back	Predicted	Absolute Error (%)
2012	104,268,159	104,351,856	0.1%
2013	105,022,884	104,983,648	0.0%
2014	106,363,260	104,664,908	1.6%
2015	108,051,895	105,735,750	2.1%
2016	107,489,531	106,537,780	0.9%
2017	102,755,876	104,655,297	1.8%
2018	105,457,972	108,702,808	3.1%
2019	106,180,778	106,292,383	0.1%
2020	99,740,924	100,087,763	0.3%
2021	104,101,974	103,650,132	0.4%

Mean Absolute Percentage Error (Annual)	1.2%
Mean Absolute Percentage Error (Monthly)	2.6%

Table 12 GS < 50 model error

2.3 GS > 50

For the GS > 50 class, the regression equation was estimated using 120 observations from 2012:01-2021:12. GS > 50 consumption is relatively flat when the average monthly temperature is between 14°C and 16°C and increases as average temperatures deviate from that range. HDD relative to 14°C and CDD relative to 16°C were found to provide the strongest results. HDD and CDD measures near 14°C and 16°C, respectively, were also considered but found to be less predictive of monthly consumption.

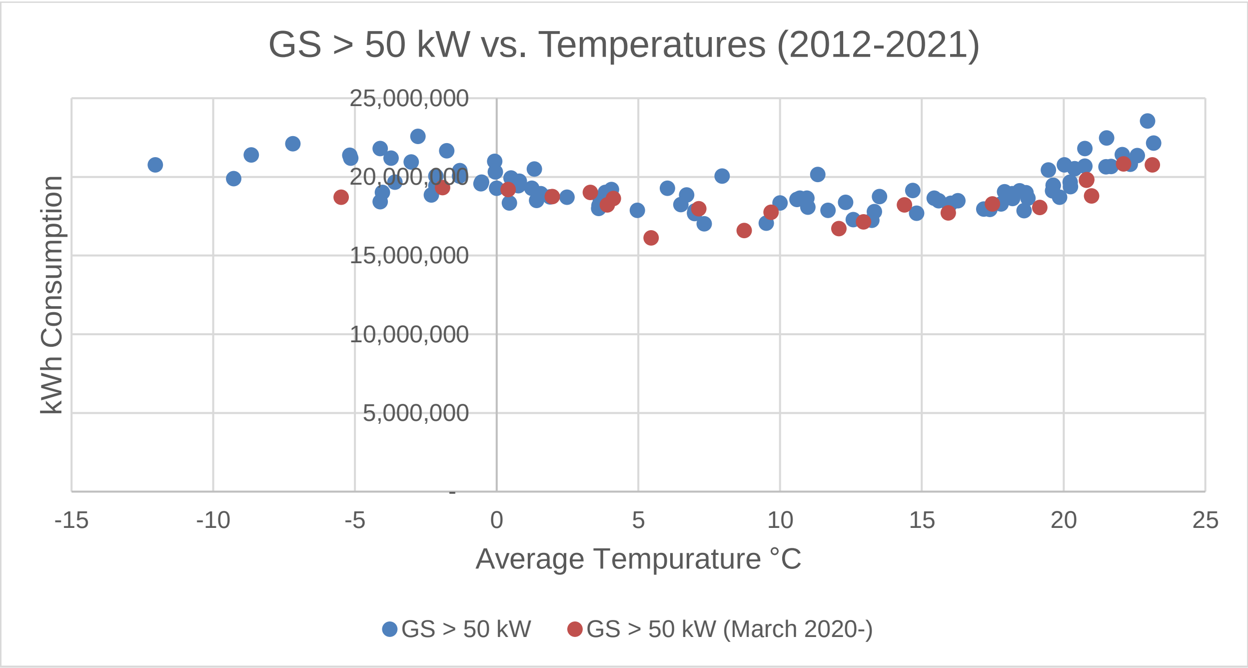

Figure 5 GS>50 kWh and Average Temperature

Economic variables were tested but found not to have a statistically significant relationship with class consumption. This includes employment data for London and Ontario (both seasonally adjusted and unadjusted) and GDP data for Ontario as a whole.

The number of GS > 50 kW customers was found to be a statistically significant.

The number of days in the month and COVID_2020 variables were found to be statistically significant. The Fall variable, equal to 1 in September and October and 0 in all other months, is also statistically significant.

The a time trend and binary calendar variables representing other seasons and months were tested but found to not have a statistically significant relationship to energy use.

The following table outlines the resulting regression model:

Model 3: Prais-Winsten, using observations 2012:01-2021:12 (T = 120) Dependent variable: GSgt50kWh_NoCDM rho = 0.128838				
	coefficient	std. error	t-ratio	p-value
const	(5,731,273)	2,265,251.7	(2.530)	0.01278
HDD14	7,290	454.9	16.027	0.00000
CDD16	23,906	1,391.4	17.182	0.00000
MonthDays	520,578	63,778.2	8.162	0.00000
Fall	472,832	174,571.8	2.709	0.00781
GSgt50Cust	16,320	2,766.1	5.900	0.00000
COVID2020	(1,403,212)	429,582.5	(3.266)	0.00144
Statistics based on the rho-differenced data				
Mean dependent var	19,253,611	S.D. dependent var	1,396,287	
Sum squared resid	3.89E+13	S.E. of regression	586,819	
R-squared	0.83238	Adjusted R-squared	0.8235	
F(6, 113)	94.203	P-value(F)	0.0000	
rho	0.0072	Durbin-Watson	1.9689	

Table 13 GS > 50 Regression Model

Using the above model coefficients we derive the following:

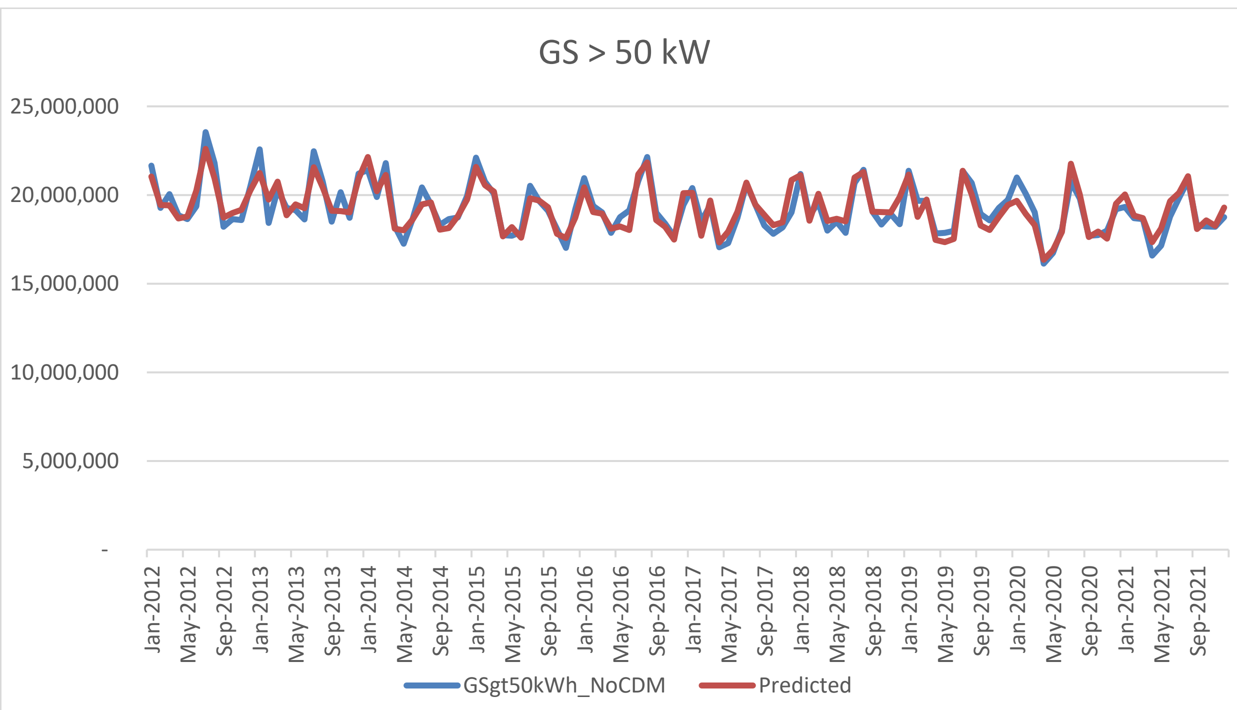

Figure 6 GS > 50 Predicted vs Actual observations

Annual estimates using actual weather are compared to actual values in the table below. Mean absolute percentage error (MAPE) for annual estimates for the period is 1.0%. The MAPE calculated monthly over the period is 2.4%.

	GS>50 kWh		Absolute
	CDM Added Back	Predicted	Error (%)
2012	239,151,128	238,329,379	0.3%
2013	240,130,287	239,502,953	0.3%
2014	232,792,169	232,001,675	0.3%
2015	229,872,865	228,717,989	0.5%
2016	232,540,270	230,170,574	1.0%
2017	224,777,270	228,477,158	1.6%
2018	230,739,672	234,750,429	1.7%
2019	232,916,070	227,921,940	2.1%
2020	224,174,483	222,464,087	0.8%
2021	223,339,046	228,104,851	2.1%
Mean Absolute Percentage Error (Annual)			1.0%
Mean Absolute Percentage Error (Monthly)			2.4%

Table 14 GS > 50 model error

2.4 INTERMEDIATE

For the Intermediate class, the regression equation was estimated using 120 observations from 2012:01-2021:12. The class has lost a few customers in this period and is known to lose one more by the 2023 Test Year so the forecast is based on monthly consumption of the 8 customers remaining in the Intermediate class. Intermediate consumption is generally not very weather-sensitive. It is relatively flat at most temperatures but increases slightly as temperatures exceed 16°C. CDD relative to 16°C was found to provide the strongest results. The weather variable does not have a significant impact but is statistically significant. HDD variables and CDD measures near 16°C were also considered but found to be less predictive of monthly consumption.

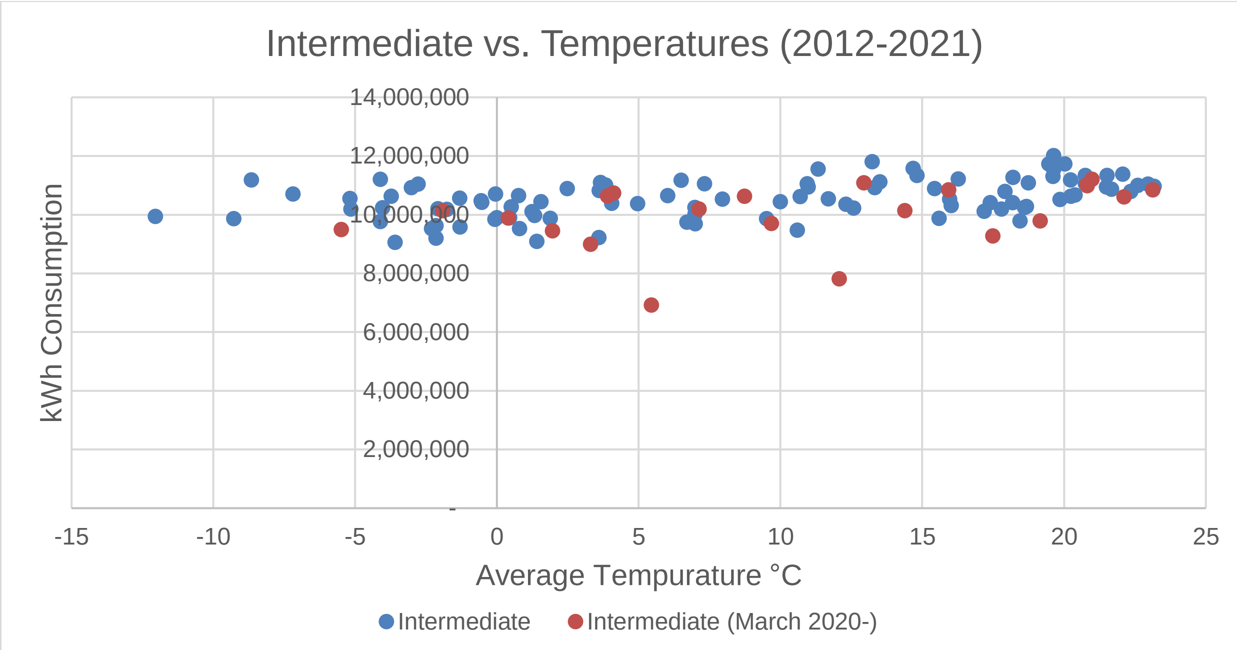

Figure 7 Intermediate and Average Temperature

Economic variables were tested and multiple were found to have a statistically significant relationship with class consumption. The variable with the strongest statistical results is a composite of the Agriculture GDP and Mining GDP figures from Statistics Canada.[6] This variable "AgMin_GDP" is the sum of these two GDP measures.

The number of days in the month and COVID_2020 variables were found to be statistically significant. A time trend is also found to be statistically significant. A binary December variable, equal to 1 in December and 0 in all other months, was found to be statistically significant. A version of the model without this variable was tested and consumption in December was regularly underestimated so this variable was introduced.

The customer count, and other binary calendar variables representing seasons and months were tested but found to not have a statistically significant relationship to energy use.

[6] Statistics Canada Industries #11 (Agriculture, Forestry, Fishing and Hunting) and #21 (Mining, Quarrying and Oil and Gas Extraction)

The following table outlines the resulting regression model:

Model 4: Prais-Winsten, using observations 2012:01-2021:12 (T = 120) Dependent variable: IntkWh_NoCDM rho = 0.360528				
	coefficient	std. error	t-ratio	p-value
const	(4,971,735)	3,255,332.3	(1.527)	0.12949
CDD16	3,381	760.4	4.446	0.00002
MonthDays	339,836	39,232.5	8.662	0.00000
Trend	(11,162)	3,280.3	(3.403)	0.00092
Dec	(589,807)	129,261.8	(4.563)	0.00001
AgMin_GDP	377	211.6	1.783	0.07734
COVID2020	(2,572,166)	360,760.3	(7.130)	0.00000
Statistics based on the rho-differenced data				
Mean dependent var	10,448,925	S.D. dependent var	767,372	
Sum squared resid	1.88E+13	S.E. of regression	407,568	
R-squared	0.73217	Adjusted R-squared	0.7179	
F(6, 113)	43.038	P-value(F)	0.0000	
rho	-0.0298	Durbin-Watson	2.0303	

Table 15 Intermediate Regression Model

Using the above model coefficients we derive the following:

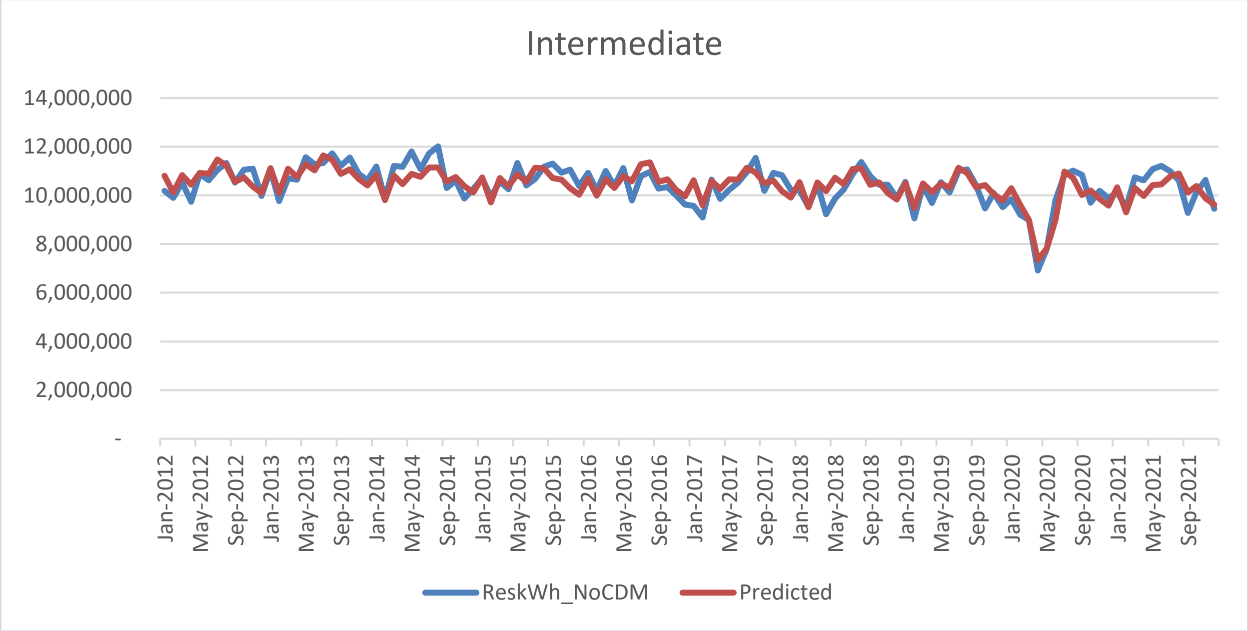

Figure 8 Intermediate Predicted vs Actual observations

Annual estimates using actual weather are compared to actual values in the table below. Mean absolute percentage error (MAPE) for annual estimates for the period is 1.4%. The MAPE calculated monthly over the period is 3.3%.

	Intermediate CDM Added Back	Predicted	Absolute Error (%)
2012	126,900,043	128,451,306	1.2%
2013	132,359,271	131,526,163	0.6%
2014	131,121,698	127,734,872	2.6%
2015	128,738,569	126,902,451	1.4%
2016	125,457,795	127,070,194	1.3%
2017	124,576,354	125,651,274	0.9%
2018	123,353,903	125,048,379	1.4%
2019	121,939,262	124,108,938	1.8%
2020	115,050,344	114,415,394	0.6%
2021	124,373,728	122,511,886	1.5%
Mean Absolute Percentage Error (Annual)			1.4%
Mean Absolute Percentage Error (Monthly)			3.3%

Table 16 Intermediate model error

2.5 LARGE USE

For the Large Use class, the regression equation was estimated using 120 observations from 2012:01-2021:12. Large Use consumption is generally not weather-sensitive and no weather-related variables were found to be statistically significant.

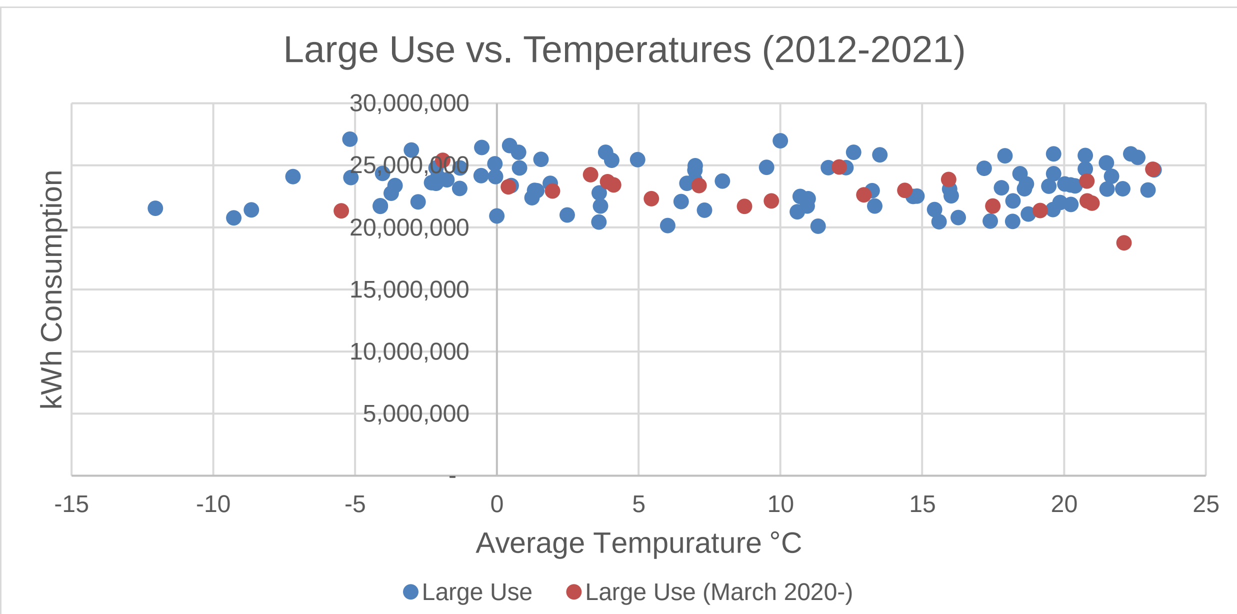

Figure 9 Large Use and Average Temperature

Economic variables were tested and multiple were found to have a statistically significant relationship with class consumption. Oil & Gas[7] was found to be the most statistically significant so it is used. Notably, the increase in Oil & Gas GDP in 2016 is aligned with the increase in Large Use consumption.

The number of days in the month and COVID_AM variables were found to be statistically significant. The Fall variable is also statistically significant.

The customer count, a time trend, and other binary calendar variables representing seasons and months were tested but found to not have a statistically significant relationship to energy use.

The following table outlines the resulting regression model:

Model 5: Prais-Winsten, using observations 2012:01-2021:12 (T = 120) Dependent variable: LUkWh_NoCDM rho = 0.348851				
	coefficient	std. error	t-ratio	p-value
const	95,810	3,603,532.3	0.027	0.97883
MonthDays	734,505	118,018.8	6.224	0.00000
OG_GDP	6,491	1,342.2	4.836	0.00000
COVID_AM	(1,714,222)	776,843.2	(2.207)	0.02933
Fall	(813,495)	334,777.2	(2.430)	0.01665
Statistics based on the rho-differenced data				
Mean dependent var	23,340,129	S.D. dependent var	1,712,133	
Sum squared resid	1.81E+14	S.E. of regression	1,255,044	
R-squared	0.48077	Adjusted R-squared	0.4627	
F(4, 115)	25.035	P-value(F)	0.0000	
rho	-0.0056	Durbin-Watson	2.0034	

Table 17 Large Use Regression Model

[7] Statistics Canada Industry #211 (Oil and Gas Extraction)

Using the above model coefficients we derive the following:

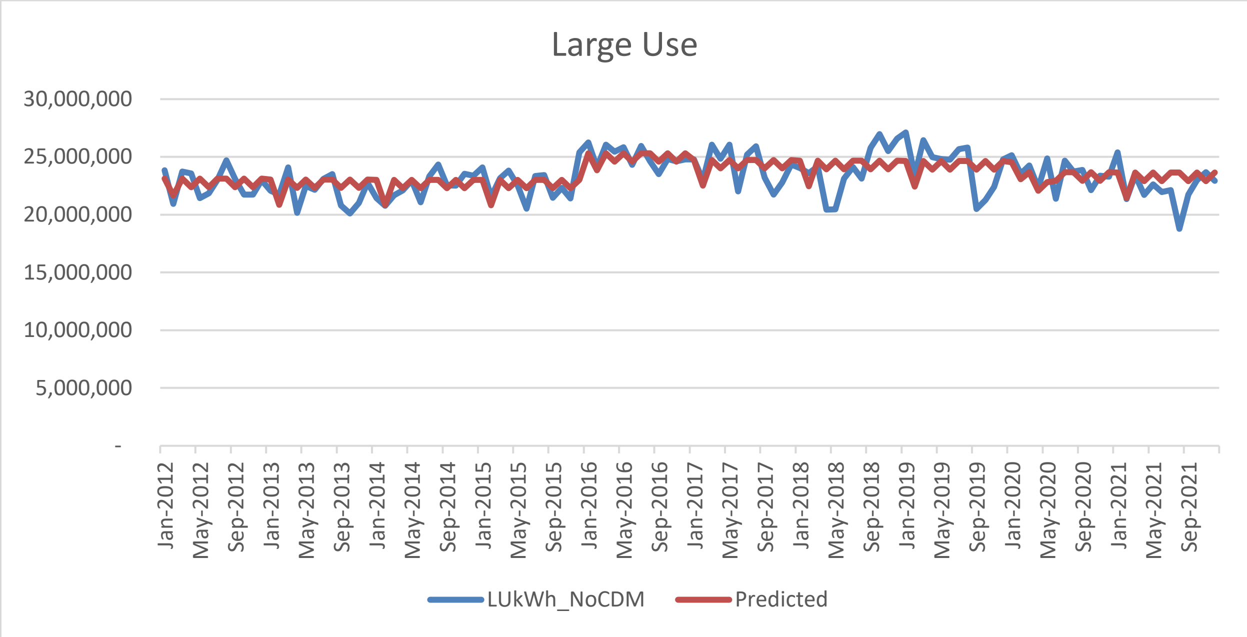

Figure 10 Large Use Predicted vs Actual observations

Annual estimates using actual weather are compared to actual values in the table below. Mean absolute percentage error (MAPE) for annual estimates for the period is 0.8%. The MAPE calculated monthly over the period is 4.6%.

	GS>50 kWh CDM Added Back	Predicted	Absolute Error (%)
2012	272,631,443	272,961,693	0.1%
2013	264,005,036	271,401,577	2.8%
2014	269,674,221	271,183,491	0.6%
2015	273,020,470	271,066,659	0.7%
2016	300,337,645	299,357,882	0.3%
2017	289,950,037	291,636,838	0.6%
2018	287,949,072	290,819,016	1.0%
2019	291,923,131	290,491,887	0.5%
2020	282,590,152	279,655,913	1.0%
2021	268,734,236	278,524,180	3.6%
Mean Absolute Percentage Error (Annual)			0.8%
Mean Absolute Percentage Error (Monthly)			4.6%

Table 18 Large Use model error

3 WEATHER NORMALIZATION AND ECONOMIC FORECAST

It is not possible to accurately forecast weather for months or years in advance. Therefore, future weather expectations can be based only on what has happened in the past. Individual years may experience unusual spells of weather (unusually cold winter, unusually warm summer, etc.). However, over time, these unusual spells “average” out. While there may be trends over several years (e.g., warmer winters for example), using several years of data rather than one particular year filters out the extremes of any particular year. While there are several different approaches to determining an appropriate weather normal, Bluewater has adopted the most recent 10-year monthly degree day average as the definition of weather normal, consistent with many LDCs load forecast filings for cost-of-service rebasing applications.

It is Elenchus’ opinion that the 10-year average HDD and CDD are more appropriate weather figures for the purposes of short-term load forecasts. The 20-year trend figures tend to be over reliant on the first and last year values, which can sometimes lead to negative values for HDD and CDD, and are typically more volatile from year to year than 10-year average values.

Additionally, no weather station in Sarnia has a full set of 20 years of data. Weather trends would therefore reflect both a trend in weather and difference between two weather stations. The Sarnia Climate weather station has been in operation since 2005 so there is sufficient data for 10-year average variables.

3.1 10-YEAR AVERAGE

The table below displays the most recent 10-year average of heating degree days and cooling degree days for a number of temperature thresholds based on temperatures reported by Environment Canada for Sarnia Climate, which is used as the weather station for Bluewater.

In a few instances in the 2012 to 2021 period, daily Sarnia Climate data was not available. If data was not available from the Sarnia Climate weather station, data from the “Sarnia” weather station or “Sarnia Airport” weather station was used.

	8°C		10°C		12°C		14°C		16°C		18°C		20°C	
	HDD	CDD	HDD	CDD	HDD	CDD	**HDD**	CDD	HDD	**CDD**	HDD	CDD	HDD	CDD
January	363	0	425	0	473	0	**549**	0	611	**0**	673	0	735	0
February	339	1	395	0	445	0	**508**	0	564	**0**	621	0	677	0
March	224	17	279	10	321	4	**396**	3	456	**1**	517	0	579	0
April	82	38	125	21	172	8	**228**	4	285	**1**	344	0	404	0
May	11	186	26	139	48	114	**77**	66	114	**42**	159	25	210	13
June	0	326	0	267	1	215	**5**	152	15	**102**	37	63	68	35
July	0	423	0	361	0	307	**0**	237	1	**176**	5	118	18	69
August	0	401	0	339	0	291	**0**	215	1	**153**	7	98	24	52
September	0	282	0	222	3	160	**13**	115	32	**73**	61	42	99	21
October	17	123	40	84	59	62	**110**	31	157	**16**	211	7	268	2
November	141	20	191	10	249	6	**303**	2	361	**0**	421	0	481	0
December	251	2	312	0	346	0	**435**	0	497	**0**	559	0	621	0

Table 19 - 10 Year Average HDD and CDD

HDD based on 14°C and CDD based on 16°C are used in this forecast.

3.2 ECONOMIC FORECAST

GDP and employment forecasts are based on the mean forecasts of two major Canadian banks Scotiabank, and BMO as of September 2022. TD and RBC were not included as their forecasts were out of date. Average forecast rates are applied to the most recent GDP and Labour Force Survey monthly data available.

	TD	BMO	Scotia	RBC	Average (BMO & Scotia)	Average (All)
Report Date	***22-Jun-22***	**16-Sep-22**	**12-Sep-22**	***7-Jun-22***		
FTE (Employment growth % YoY)						
2021	*4.9%*	4.9%	4.9%	*4.9%*	4.90%	*4.90%*
2022	*4.9%*	4.3%	4.5%	*4.7%*	4.40%	*4.60%*
2023	*0.6%*	0.8%	1.0%	*1.2%*	0.90%	*0.90%*
GDP (Real % YoY)						
2021	*4.3%*	4.6%	4.3%	*4.6%*	4.45%	*4.45%*
2022	*3.6%*	2.9%	3.2%	*4.1%*	3.05%	*3.45%*
2023	*1.6%*	0.7%	1.0%	*1.9%*	0.85%	*1.30%*

Table 20 Economic Forecasts

For example, the 2022 forecast FTE growth rate, 4.40%, is applied to the number of January 2021 FTEs to forecast the number of incremental FTEs in January 2022. The January 2023 FTE forecast is then determined by applying 0.90%, the 2023 FTE forecast growth rate, to the January 2022 forecast.

4 CLASS SPECIFIC NORMALIZED FORECASTS

4.1 RESIDENTIAL

Incorporating the forecast economic variables, 10-yr weather normal heating and cooling degree days, and calendar variables, the following weather corrected consumption and forecast values are calculated:

Residential kWh						
Year	Actual	Cumulative Persisting CDM	Actual No CDM	Normalized No CDM	Cumulative Persisting CDM	Normalized
	A	B	C = A + B	D	E = B	F = D - E
2012	256,220,601	1,648,705	257,869,306	258,679,855	1,648,705	257,031,150
2013	255,389,582	2,457,480	257,847,061	259,649,096	2,457,480	257,191,616
2014	248,491,220	3,669,783	252,161,004	260,324,484	3,669,783	256,654,701
2015	247,531,815	4,941,125	252,472,940	260,871,032	4,941,125	255,929,907
2016	254,829,615	7,049,693	261,879,307	262,662,302	7,049,693	255,612,610
2017	243,695,248	12,222,429	255,917,677	263,968,711	12,222,429	251,746,282
2018	259,006,064	15,150,417	274,156,481	266,008,956	15,150,417	250,858,539
2019	251,122,549	16,025,383	267,147,932	269,040,175	16,025,383	253,014,791
2020	270,338,602	15,803,150	286,141,752	284,461,842	15,803,150	268,658,692
2021	275,475,848	15,339,518	290,815,366	292,215,965	15,339,518	276,876,447
2022				285,568,770	15,277,587	270,291,183
2023				280,767,748	15,175,531	265,592,217

Table 21 Actual vs Normalized Residential kWh

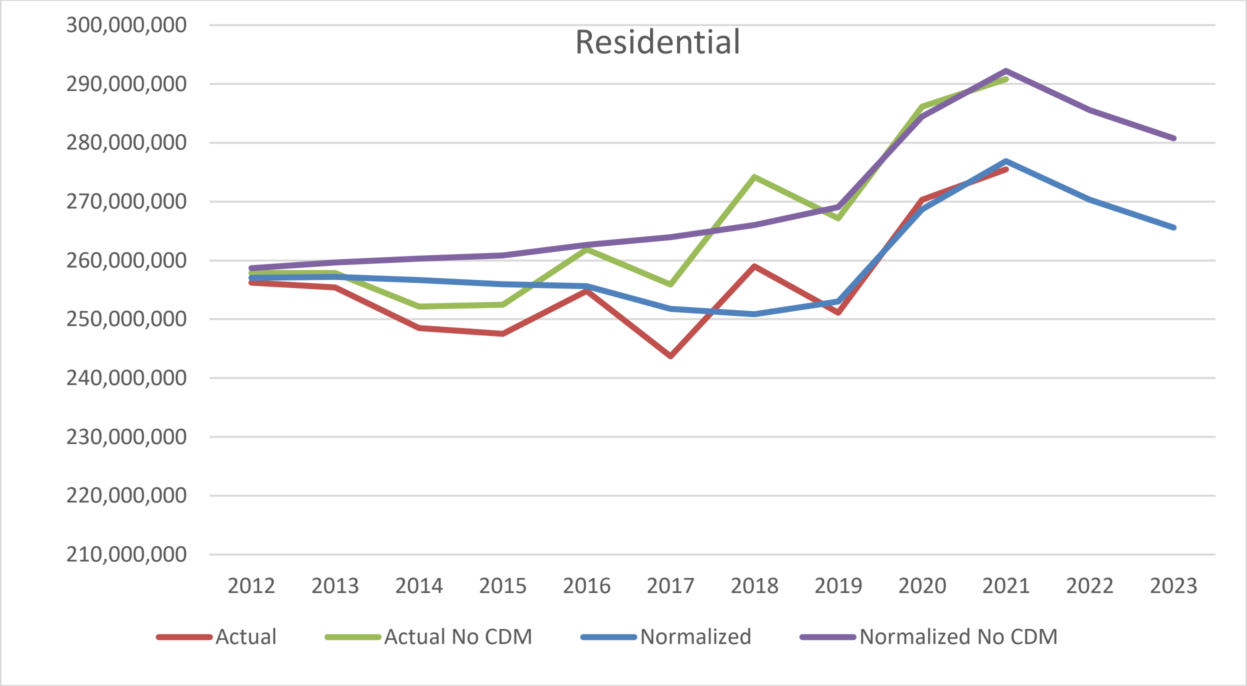

Figure 11 Actual vs Normalized Residential kWh

Note that the vertical intercept does not begin at 0 in any figure in this section. While Residential customer counts are not a component of the regression model, they are forecasted for the purpose of rate setting. The Geometric mean of the annual growth from 2012 to 2021 was used to forecast the growth rate from 2021 to 2023.

Year	Residential Customers	Percent of Prior Year
2012	31,896	
2013	32,002	100.33%
2014	32,139	100.43%
2015	32,277	100.43%
2016	32,434	100.49%
2017	32,605	100.53%
2018	32,755	100.46%
2019	32,862	100.32%
2020	32,990	100.39%
2021	33,113	100.37%
2022	33,251	100.42%
2023	33,390	100.42%

Table 22 Forecasted Residential Customer Count

4.2 GS < 50

Incorporating the forecast economic variables, 10-yr weather normal heating and cooling degree days, and calendar variables, the following weather corrected consumption and forecast values are calculated:

GS < 50 kWh						
Year	Actual	Cumulative Persisting CDM	Actual No CDM	Normalized No CDM	Cumulative Persisting CDM	Normalized
	A	B	C = A + B	D	E = B	F = D - E
2012	103,403,740	864,420	104,268,159	105,683,533	864,420	104,819,113
2013	103,284,259	1,738,625	105,022,884	105,325,097	1,738,625	103,586,472
2014	103,923,431	2,439,829	106,363,260	105,403,533	2,439,829	102,963,704
2015	104,997,600	3,054,295	108,051,895	106,456,040	3,054,295	103,401,745
2016	103,858,081	3,631,451	107,489,531	106,125,877	3,631,451	102,494,427
2017	99,503,004	3,252,872	102,755,876	106,103,988	3,252,872	102,851,117
2018	101,399,120	4,058,852	105,457,972	107,179,296	4,058,852	103,120,444
2019	101,723,563	4,457,215	106,180,778	107,051,609	4,457,215	102,594,394
2020	94,820,550	4,920,375	99,740,924	101,361,838	4,920,375	96,441,463
2021	98,943,526	5,158,448	104,101,974	103,970,303	5,158,448	98,811,855
2022				108,461,335	5,073,710	103,387,625
2023				110,297,605	4,979,877	105,317,729

Table 23 Actual vs Normalized GS < 50 kWh

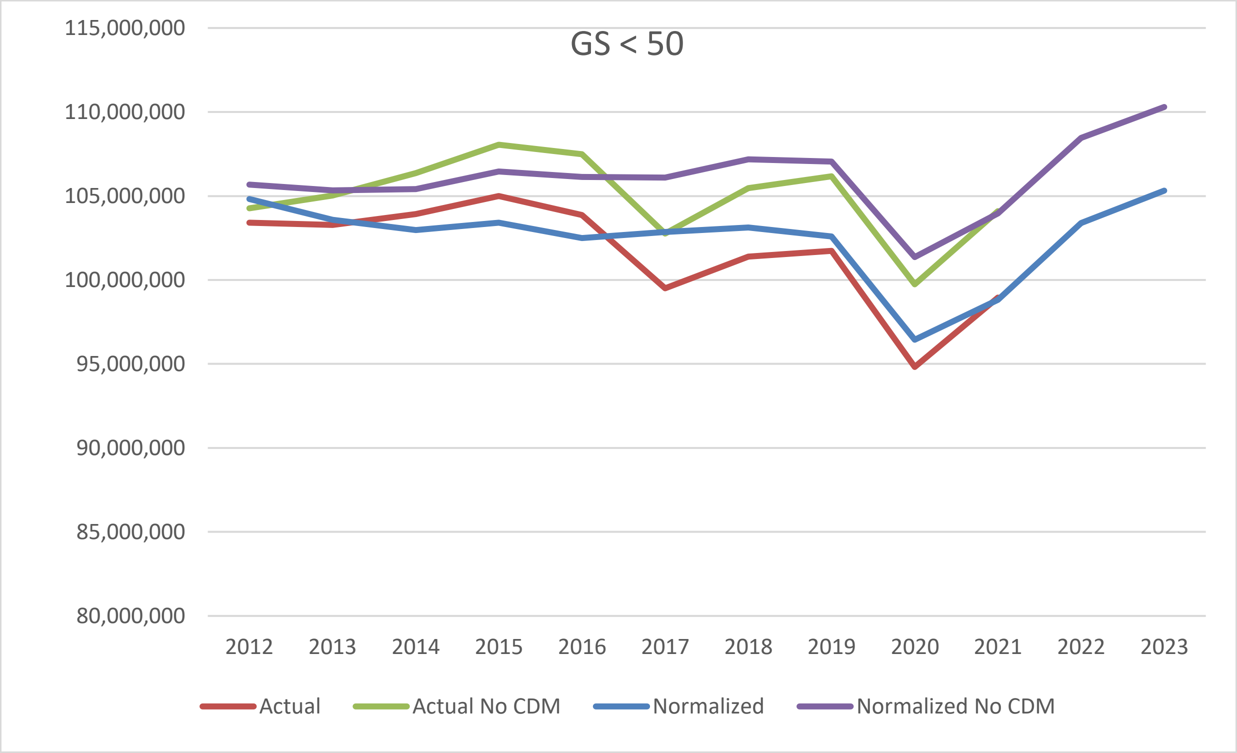

Figure 12 Actual vs Normalized GS < 50 kWh

While GS < 50 customer counts are not a component of the regression model, they are forecasted for the purpose of rate setting. The Geometric mean of the annual growth from 2012 to 2021 was used to forecast the growth rate from 2021 to 2023. Additionally, 32 known customer additions at the start of 2022, including 7 customers reclassified from the GS > 50 kW rate class, have been added to the 2022 customer count.

The following table includes the customer Actual / Forecast customer count on this basis:

Year	GS < 50 Customers	Percent of Prior Year
2012	428	
2013	428	100.02%
2014	393	91.79%
2015	377	95.87%
2016	373	98.96%
2017	382	102.46%
2018	389	101.90%
2019	372	95.61%
2020	369	98.97%
2021	372	101.02%
2022	359.5	98.45%
2023	353.9	98.45%

Table 24 Forecasted GS < 50 Customer Count

4.3 GS > 50

Incorporating the 10-yr weather normal heating and cooling degree days, and calendar variables, the following weather corrected consumption and forecast values are calculated:

GS < 50 kWh

Year	Actual	Cumulative Persisting CDM	Actual No CDM	Normalized No CDM	Cumulative Persisting CDM	Normalized
	A	B	C = A + B	D	E = B	F = D - E
2012	234,251,735	4,899,393	239,151,128	239,788,930	4,899,393	234,889,537
2013	233,430,195	6,700,092	240,130,287	239,186,751	6,700,092	232,486,658
2014	224,657,846	8,134,323	232,792,169	232,201,619	8,134,323	224,067,296
2015	218,194,347	11,678,518	229,872,865	229,019,142	11,678,518	217,340,624
2016	216,056,700	16,483,571	232,540,270	228,772,661	16,483,571	212,289,090
2017	204,648,181	20,129,089	224,777,270	230,047,327	20,129,089	209,918,238
2018	206,166,950	24,572,722	230,739,672	231,467,201	24,572,722	206,894,480
2019	203,960,180	28,955,890	232,916,070	228,284,724	28,955,890	199,328,833
2020	192,408,296	31,766,188	224,174,483	223,763,325	31,766,188	191,997,137
2021	190,301,137	33,037,909	223,339,046	227,909,354	33,037,909	194,871,445
2022				225,216,488	32,613,324	192,603,165
2023				224,119,758	32,007,474	192,112,284

Table 25 Actual vs Normalized GS > 50 kWh

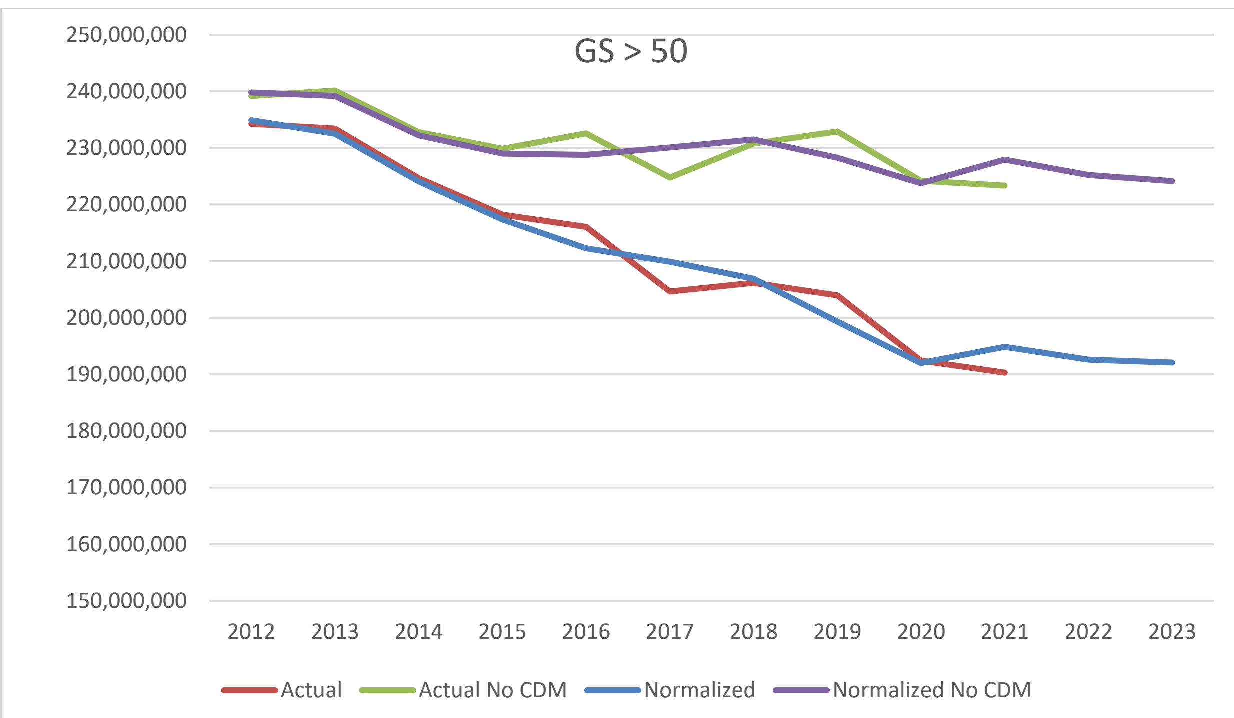

Figure 13 Actual vs Normalized GS > 50 kWh

The Geometric mean of the annual growth from 2012 to 2021 was used to forecast the customer count growth rate from 2021 to 2023. Additionally, the 2022 customer count has been reduced by 7 customers as these customers have been reclassified as GS < 50 kW at the start of 2022.

The following table includes the customer Actual / Forecast customer count on this basis:

Year	GS > 50 Customers	Percent of Prior Year
2012	428	
2013	428	100.02%
2014	393	91.79%
2015	377	95.87%
2016	373	98.96%
2017	382	102.46%
2018	389	101.90%
2019	372	95.61%
2020	369	98.97%
2021	372	101.02%
2022	359.5	98.45%
2023	353.9	98.45%

Table 26 Forecasted GS > 50 Customer Count

In order to normalize and forecast class kW for those classes that bill based on kW (demand) billing determinants, the relationship between billed kW and kWh is used. The ratio is calculated as the 10-year average kW/kWh ratio from 2012-2021.

	GS > 50		
	kWh	kW	Ratio
	A	B	C = B / A
2012	234,251,735	664,968	0.002839
2013	233,430,195	653,752	0.002801
2014	224,657,846	633,553	0.002820
2015	218,194,347	608,069	0.002787
2016	216,056,700	600,289	0.002778
2017	204,648,181	586,836	0.002868
2018	206,166,950	584,728	0.002836
2019	203,960,180	559,698	0.002744
2020	192,408,296	535,864	0.002785
2021	190,301,137	533,890	0.002806
	kWh Normalized	kW Normalized	Average Trend
	E	F = E * G	G
2021	194,871,445	546,868	0.002806
2022	192,603,165	540,503	0.002806
2023	192,112,284	539,125	0.002806

Table 27 Forecasted GS > 50 kW

4.4 INTERMEDIATE

Incorporating the forecast economic variables, 10-yr weather normal cooling degree days, and calendar variables, the following weather corrected consumption and forecast values are calculated:

			Intermediate kWh			
Year	Actual	Cumulative Persisting CDM	Actual No CDM	Normalized No CDM	Cumulative Persisting CDM	Normalized
	A	B	C = A + B	D	E = B	F = D - E
2012	126,895,903	4,140	126,900,043	128,240,309	4,140	128,236,169
2013	132,211,131	148,140	132,359,271	131,674,886	148,140	131,526,746
2014	130,549,125	572,572	131,121,698	128,296,394	572,572	127,723,821
2015	127,712,881	1,025,687	128,738,569	127,089,715	1,025,687	126,064,028
2016	124,246,026	1,211,769	125,457,795	126,727,682	1,211,769	125,515,913
2017	123,613,582	962,772	124,576,354	125,679,639	962,772	124,716,868
2018	122,358,954	994,949	123,353,903	124,802,559	994,949	123,807,610
2019	120,082,524	1,856,738	121,939,262	124,305,330	1,856,738	122,448,593
2020	112,049,205	3,001,139	115,050,344	114,387,299	3,001,139	111,386,160
2021	120,904,791	3,468,937	124,373,728	122,217,044	3,468,937	118,748,107
2022				122,801,265	3,458,454	119,342,811
2023				121,823,304	3,440,661	118,382,643

Table 28 Actual vs Normalized Intermediate

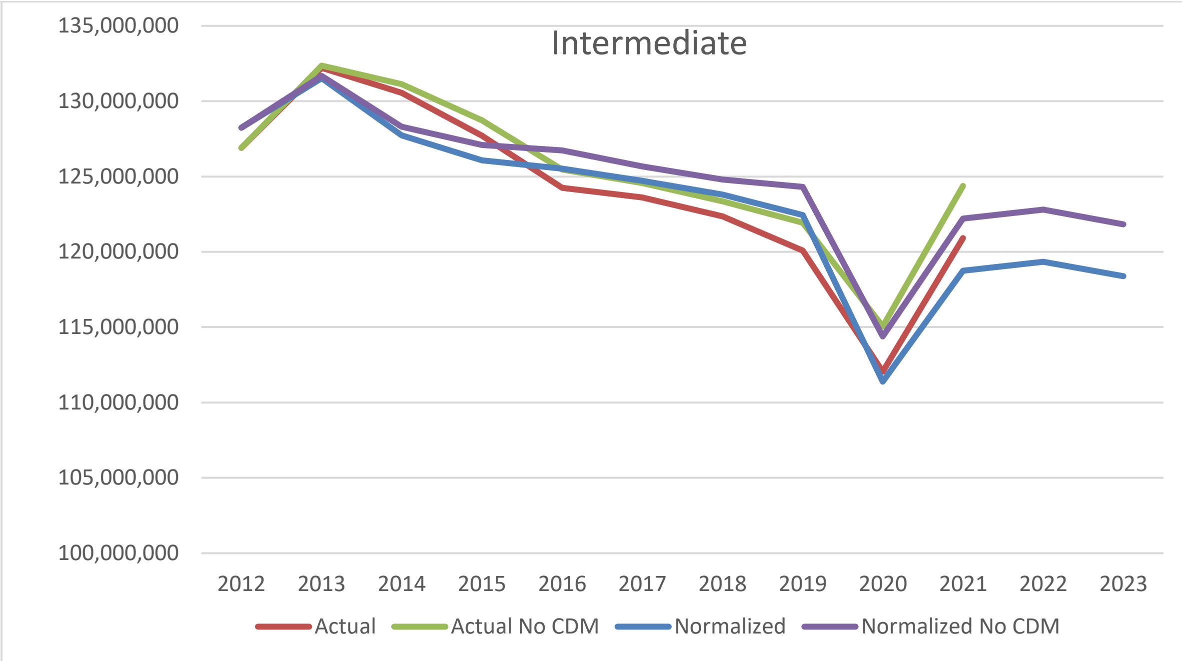

Figure 14 Actual vs Normalized Intermediate

The class has declined in customer counts over the past 10 years. Bluewater is aware of one customer that will be reclassified as GS > 50 kW at the start of 2023. The number of customers in 2022 and 2023 reflects known customer counts so these values are not derived mathematically.

The following table includes the customer Actual / Forecast customer count on this basis:

Year	Intermediate Customers	Percent of Prior Year
2012	13	100.00%
2013	13	96.15%
2014	12	96.00%
2015	12	100.00%
2016	12	96.53%
2017	11	94.96%
2018	11	100.00%
2019	11	100.00%
2020	10	90.91%
2021	9	90.00%
2022	9	100.00%
2023	8	88.89%

Table 29 Forecasted Intermediate Customer Count

In order to normalize and forecast class kW for those classes that bill based on kW (demand) billing determinants, the relationship between billed kW and kWh is used. The ratio is calculated as the 10-year average kW/kWh ratio from 2012-2021.

		Intermediate	
	kWh	kW	Ratio
	A	B	C = B / A
2012	126,895,903	245,826	0.001937
2013	132,211,131	252,595	0.001911
2014	130,549,125	258,573	0.001981
2015	127,712,881	250,508	0.001961
2016	124,246,026	237,320	0.001910
2017	123,613,582	242,930	0.001965
2018	122,358,954	241,691	0.001975
2019	120,082,524	232,238	0.001934
2020	112,049,205	216,945	0.001936
2021	120,904,791	233,289	0.001930
	kWh Normalized	kW Normalized	Average Trend
	E	F = E * G	G
2021	118,748,107	230,848	0.001944
2022	119,342,811	232,004	0.001944
2023	118,382,643	230,138	0.001944

Table 30 Forecasted Intermediate

4.5 LARGE USE

Incorporating the forecast economic variables and calendar variables, the following consumption and forecast values are calculated:

Large Use

Year	Actual	Cumulative Persisting CDM	Actual No CDM	Normalized No CDM	Cumulative Persisting CDM	Normalized
	A	B	C = A + B	D	E = B	F = D - E
2012	272,631,443	0	272,631,443	271,334,704	0	271,334,704
2013	264,004,766	270	264,005,036	269,774,588	270	269,774,318
2014	269,591,766	82,454	269,674,221	269,556,502	82,454	269,474,048
2015	272,823,999	196,470	273,020,470	269,439,670	196,470	269,243,200
2016	300,037,283	300,362	300,337,645	297,730,893	300,362	297,430,531
2017	289,478,994	471,043	289,950,037	290,009,849	471,043	289,538,806
2018	287,387,431	561,641	287,949,072	289,192,027	561,641	288,630,385
2019	290,955,053	968,078	291,923,131	288,864,898	968,078	287,896,819
2020	281,204,845	1,385,307	282,590,152	278,028,924	1,385,307	276,643,617
2021	266,221,942	2,512,294	268,734,236	276,897,191	2,512,294	274,384,896
2022				282,636,601	2,494,270	280,142,331
2023				285,379,312	2,480,435	282,898,876

Table 31 Actual vs Normalized Large Use

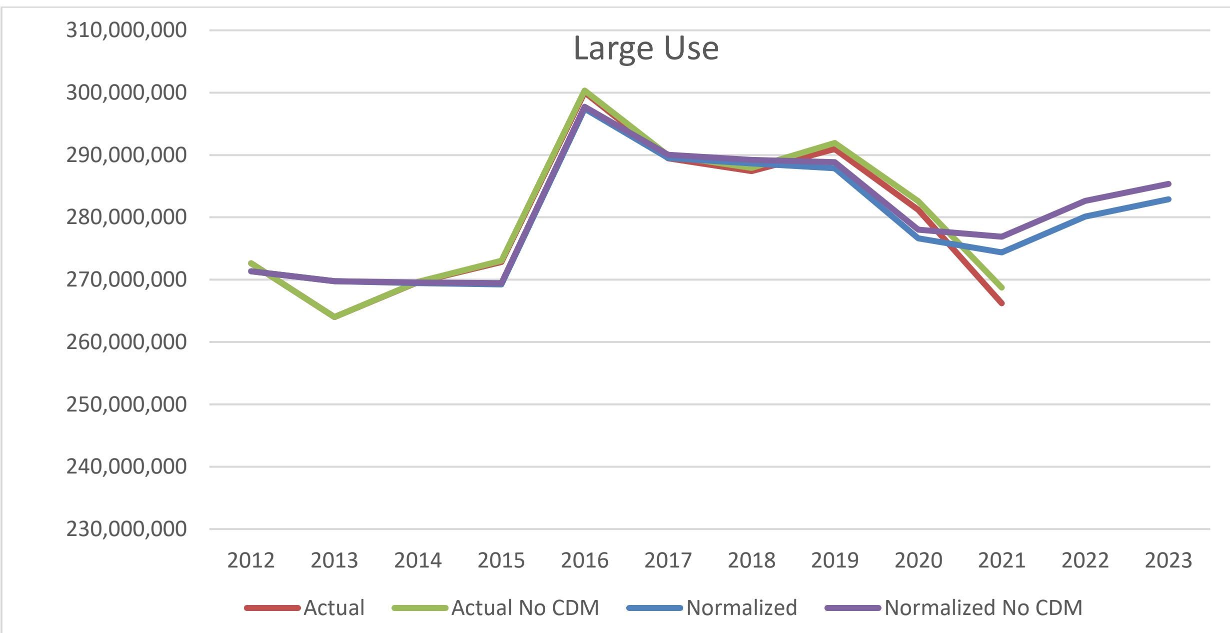

Figure 15 Actual vs Normalized Large Use

The Large Use class has had 4 customers since 2017 and is forecast to have 4 customers in the test year.

Year	Large Use Customers	Percent of Prior Year
2012	3	100.00%
2013	3	100.00%
2014	3	100.00%
2015	3	100.00%
2016	3	113.89%
2017	4	117.07%
2018	4	100.00%
2019	4	100.00%
2020	4	100.00%
2021	4	100.00%
2022	4	100.00%
2023	4	100.00%

Table 32 Forecasted Large Use Customer Count

In order to normalize and forecast class kW for those classes that bill based on kW (demand) billing determinants, the relationship between billed kW and kWh is used. The 5-year average kW/kWh ratio from 2017-2021 was used because the ratio has changed over 10 years, so a shorter time frame was used. The ratio decreased from 0.002079 in 2012 to 0.001817 in 2021 and the 5-year average is more aligned with recent ratios.

		GS > 50	
	kWh	kW	Ratio
	A	B	C = B / A
2012	272,631,443	461,827	0.001694
2013	264,004,766	446,265	0.001690
2014	269,591,766	465,256	0.001726
2015	272,823,999	459,246	0.001683
2016	300,037,283	481,850	0.001606
2017	289,478,994	479,867	0.001658
2018	287,387,431	486,459	0.001693
2019	290,955,053	477,956	0.001643
2020	281,204,845	461,493	0.001641
2021	266,221,942	471,315	0.001770
	kWh Normalized	kW Normalized	Average Trend
	E	F = E * G	G
2021	274,384,896	461,076	0.001680
2022	280,142,331	470,751	0.001680
2023	282,898,876	475,383	0.001680

Table 33 Forecasted Large Use

5 STREET LIGHT, SENTINEL LIGHT, AND USL FORECAST

The Street Lighting, Sentinel Light, and Unmetered Scattered Load classes are non-weather sensitive classes. Device counts are forecasted on the geometric mean growth rate from 2012 to 2021. Energy volumes for these classes are forecasted on the basis of average energy per device.

5.1 STREET LIGHT

The table below summarizes the historic and forecast annual energy consumption for the Street Light class. Bluewater underwent a gradual LED conversion from 2013 to 2021, which saw a 64% reduction in consumption per device. The 2021 average consumption per device is used as the average consumption per device in 2022 and 2023.

	Streetlight kWh			
Year	Actual	Devices	Average / Device	Normalized
	A	B	C = A / B	D = C * B
2012	9,019,467	10,019	900	9,019,467
2013	9,144,166	10,030	912	9,144,166
2014	8,086,583	10,051	805	8,086,583
2015	6,427,057	10,013	642	6,427,057
2016	5,119,606	10,018	511	5,119,606
2017	4,349,789	10,042	433	4,349,789
2018	3,664,817	10,068	364	3,664,817
2019	3,457,005	10,100	342	3,457,005
2020	3,449,208	10,136	340	3,449,208
2021	3,351,425	10,161	330	3,351,425
2022		10,177	330	3,356,657
2023		10,193	330	3,361,898

Table 34 Street Light Consumption Forecast

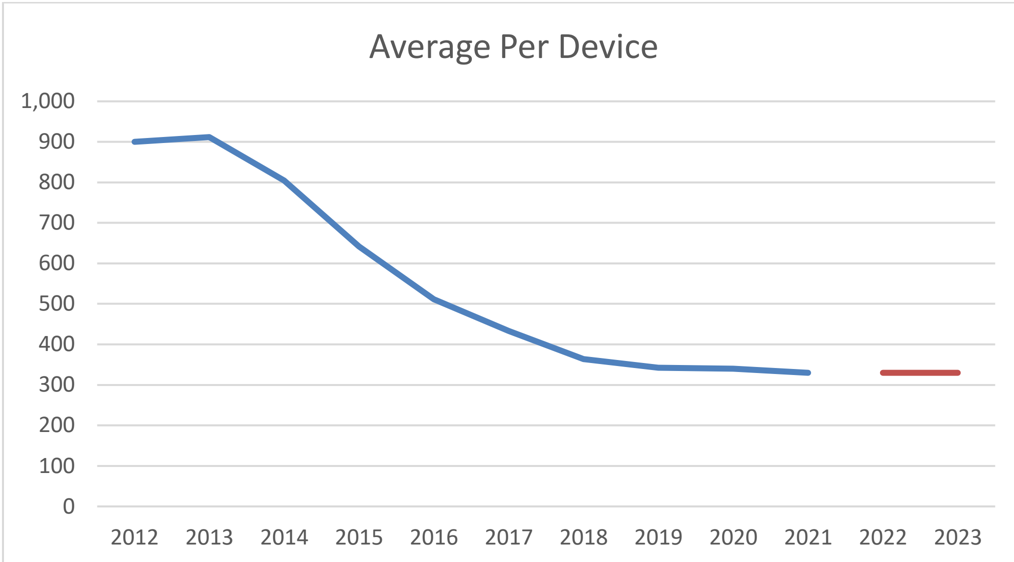

Figure 16 Street Light kWh per Luminaire Device

This declining consumption is somewhat offset by an increasing device count, as reflected in column D of Table 34 and detailed in the following table. The Geometric mean of the annual growth from 2012 to 2021 was used to forecast the growth rate from 2021 to 2023.

Street Light Year	Devices	Percent of Prior Year
2012	10,019	
2013	10,030	100.10%
2014	10,051	100.21%
2015	10,013	99.62%
2016	10,018	100.05%
2017	10,042	100.24%
2018	10,068	100.26%
2019	10,100	100.33%
2020	10,136	100.36%
2021	10,161	100.24%
2022	10,177	100.16%
2023	10,193	100.16%

Table 35 Forecasted Street Light Device Count

The 10-year average of the ratio from 2012 to 2021 is applied to normalized consumption to forecast kW demand.

	Street Lights kWh	Street Lights kW	Ratio
	A	B	C = B / A
2012	9,019,467	24,276	0.002692
2013	9,144,166	24,351	0.002663
2014	8,086,583	21,697	0.002683
2015	6,427,057	17,287	0.002690
2016	5,119,606	13,686	0.002673
2017	4,349,789	11,695	0.002689
2018	3,664,817	10,173	0.002776
2019	3,457,005	9,620	0.002783
2020	3,449,208	9,569	0.002774
2021	3,351,425	9,338	0.002786
	kWh Normalized	kW Normalized	Average Trend
	E	F = E * G	G
2021	3,351,425	9,119	0.002721
2022	3,356,657	9,133	0.002721
2023	3,361,898	9,147	0.002721

Table 36 Forecasted Street Light kW

5.2 SENTINEL LIGHTING

The table below summarizes the historic and forecast annual energy consumption for the Sentinel Lighting class. Consumption per Sentinel Lighting device has declined gradually over time, though not to the same extent as Street Lights. The 2021 average consumption per device is used as the average consumption per device in 2022 and 2023.

Sentinel Lighting kWh				
Year	Actual	Devices	Average / Device	Normalized
	A	B	C = A / B	D = C * B
2012	572,653	447	1,282	572,653
2013	547,347	428	1,280	547,347
2014	536,887	418	1,285	536,887
2015	507,380	412	1,231	507,380
2016	497,069	407	1,220	497,069
2017	476,322	391	1,217	476,322
2018	453,200	385	1,179	453,200
2019	474,592	385	1,232	474,592
2020	439,110	371	1,185	439,110
2021	433,168	367	1,181	433,168
2022		359	1,181	423,796
2023		351	1,181	414,626

Table 37 Sentinel Lighting Consumption Forecast

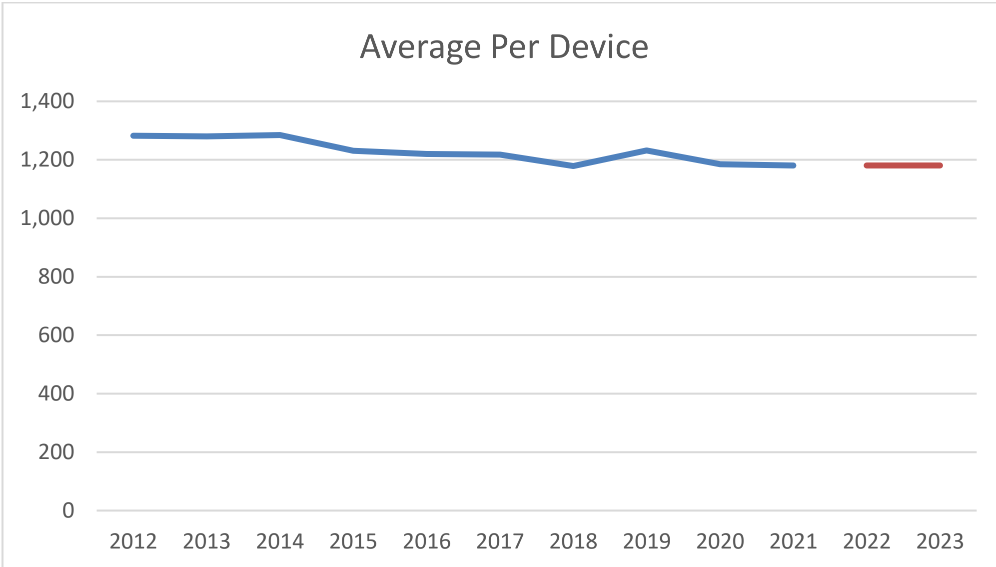

Figure 17 Sentinel Lighting kWh per Device

The Geometric mean of the annual growth from 2012 to 2021 was used to forecast the growth rate from 2021 to 2023.

Sentinel Lighting Year	Devices	Percent of Prior Year
2012	447	
2013	428	95.71%
2014	418	97.74%
2015	412	98.64%
2016	407	98.81%
2017	391	96.07%
2018	385	98.25%
2019	385	100.17%
2020	371	96.21%
2021	367	99.01%
2022	359	97.84%
2023	351	97.84%

Table 38 Forecasted Sentinel Lighting Device Count

In order to normalize and forecast class kW for those classes that bill based on kW (demand) billing determinants, the relationship between billed kW and kWh is used. The 5-year average kW/kWh ratio from 2017-2021 was used because the ratio has changed over 10 years, so a shorter time frame was used. The ratio increased from 0.002373 in 2012 to 0.002741 in 2021 and the 5-year average is more aligned with recent ratios.

	Sentinel Lightings		
	kWh	kW	Ratio
	A	B	C = B / A
2012	572,653	1,359	0.002373
2013	547,347	1,313	0.002399
2014	536,887	1,278	0.002381
2015	507,380	1,254	0.002471
2016	497,069	1,205	0.002424
2017	476,322	1,324	0.002779
2018	453,200	1,302	0.002873
2019	474,592	1,302	0.002743
2020	439,110	1,196	0.002723
2021	433,168	1,187	0.002741
	kWh Normalized	kW Normalized	Average Trend
	E	F = E * G	G
2021	433,168	1,201	0.002772
2022	423,796	1,175	0.002772
2023	414,626	1,149	0.002772

Table 39 Forecasted Sentinel Lighting kW

5.3 USL

The following table summarizes historic and forecast annual energy consumption for Bluewater’s USL class. Traffic light device counts and consumption have historically been understated. Traffic lights were counted as a single customer and monthly consumption has been understated by 3,942 kWh. Bluewater will implement the change in the 2023 Test Year. Consumption in 2023 has been forecasted based on adjusted 2021 consumption per customer calculations that include the additional consumption that will be incorporated in 2023 and the corrected device counts.

	USL				Adjusted USL			
Year	Actual	Conn.	Average / Device	Normal Forecast	Adj. Actual	Adj. Conn.	Average/ Device	Normal Forecast
	A	B	C = A / B	D = C * B				
2012	2,229,014	263	8,475	2,229,014				
2013	2,183,026	262	8,330	2,183,026				
2014	2,203,828	262	8,414	2,203,828				
2015	2,211,250	262	8,426	2,211,250				
2016	2,221,667	261	8,509	2,221,667				
2017	2,156,982	258	8,347	2,156,982				
2018	2,052,963	256	8,006	2,052,963				
2019	2,202,858	257	8,585	2,202,858				
2020	2,209,114	253	8,723	2,209,114				
2021	2,181,431	243	8,980	2,181,431	2,228,735	346	6,443	2,228,735
2022		241	8,980	2,162,262		344	6,443	2,214,968
2023						342	6,443	2,201,349

Table 40 USL Consumption Forecast

The average use per device forecast for 2022 and 2023 is based on the corrected 2021 average consumption per device. Though corrected consumption per device is lower, this is more than offset by the higher device count.

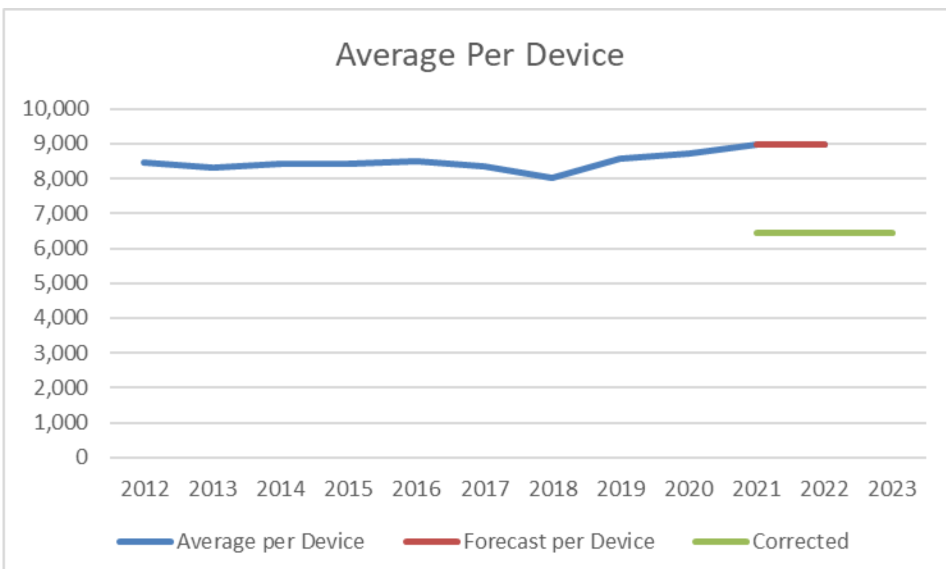

Figure 18 USL kWh per Device

The number of USL devices had decreased slightly over that past 10 years and this trend is forecast to continue to 2023. The 103 traffic lights described above have been added to the 2023 count.

USL Year	Devices	Percent of Prior Year
2012	263	
2013	262	99.65%
2014	262	99.94%
2015	262	100.19%
2016	261	99.49%
2017	258	98.98%
2018	256	99.23%
2019	257	100.06%
2020	253	98.70%
2021	243	95.92%
2022	241	99.12%
2023	342	99.12%

Table 41 Forecasted USL Devices

6 CDM ADJUSTMENT TO LOAD FORECAST

On December 20, 2021, the OEB issued a report Conservation and Demand Management Guidelines for Electricity Distributors which provided updated guidance on the role of CDM for rate-regulated LDCs. Based on these guidelines, Elenchus has derived a manual adjustment to the load forecast. CDM programs undertaken as part of the 2021-2024 Conservation and Demand Management framework will put downward pressure on its billing determinants for the General Service < 50 kW, General Service > 50 kW, Intermediate, and Large Use classes. Additionally, projects completed after cancellation of the Conservation First Framework have been included in the CDM adjustment.

This CDM adjustment has been made to reflect the impact of CDM activities that are expected to be implemented through from 2021 to 2023.

CDM activities from the Conservation First Framework are provided below.

Rate Class	2021			2022
	kWh	CDM Adj Weight	Amount	kWh
	A	B	C = A * B	D
Residential	0	0.5		
GS < 50	11,914	0.5	5,957	22,052
GS > 50	584,384	0.5	292,192	
Intermediate		0.5		4,621,841
Large Use	2,053,113	0.5	1,026,557	
Street Light		0.5		
Sentinel Light		0.5		
USL		0.5		
TOTAL	**2,649,414**	0.5	**1,324,707**	**4,643,893**

Table 42 CFF Framework Savings Allocation

Additional CDM activities have been forecast based on Bluewater's share of consumption within the province and the IESO's 2021-2024 Conservation and Demand Management Framework. The table below provides a summary of the 2021-2024 Framework and Bluewater's allocation of savings.

Program	In year energy savings (GWh)				Bluewater Share %	Basis for Bluewater %
	2021	2022	2023	2024		
Retrofit	354.3	337.8	217.2	217.2	0.75%	% of provincial kWh
Small Business	40.2	28.5	14.3	15.3	0.75%	% of provincial kWh
Energy Performance Program	21.8	17.3	34.1	35.6	0.75%	% of provincial kWh
Energy Management	16.4	47.3	115.2	115.2	0.75%	% of provincial kWh
Customer Solutions	0	0	325.7	325.7	0.75%	% of provincial kWh
Local Initiatives	52.4	52.4	62.9	62.9	0.00%	
Energy Affordability Program	47.6	50.3	52.3	54	0.57%	% of prov. LIM
First Nations Program	10.3	7.3	7.3	7.3	0.00%	

Table 43 2021-2024 CDM Framework and Bluewater Allocation

Bluewater's share of kWh is calculated with OEB Yearbook data as a 5-year average of Bluewater's Total kWh Supplied divided by the sum of Total kWh Supplied of all Ontario LDCs.

Year	Province kWh	Bluewater kWh	Bluewater % Share
2016	135,092,458,977	1,045,130,121	0.77%
2017	131,507,457,611	1,000,844,635	0.76%
2018	137,831,974,215	1,019,735,531	0.74%
2019	135,053,462,090	1,002,580,158	0.74%
2020	133,510,137,228	984,900,126	0.74%
5-Year Avg.	**134,599,098,024**	**1,010,638,114**	**0.75%**

Table 44 Bluewater kWh

Bluewater's Energy Affordability Program allocation is based on the number of households in Sarnia within the Low-Income Measure (after tax) as a share of all Ontario households, as per Statistics Canada.

Bluewater is not aware of any Local Initiatives programs so no share of that program is attributed to Bluewater.

Total GWh savings figures are then adjusted by the share attributable to Bluewater, yearly weighting factors, and converted to kWh savings. Total CDM savings attributable to Bluewater is provided in the following table.

	In year energy savings (kWh)				Total CDM
	2021	2022	2023	2024	
Weighting Factor	*0.5*	*1.0*	*0.5*	*0.0*	
Retrofit	1,330,132	2,536,373	815,424	-	4,681,929
Small Business	150,921	213,992	53,686	-	418,599
Energy Performance Program	81,843	129,897	128,020	-	339,760
Energy Management	61,570	355,152	432,490	-	849,212
Customer Solutions	-	-	1,222,760	-	1,222,760
Local Initiatives	-	-	-	-	-
Energy Affordability Program	134,571	284,408	147,858	-	566,837
First Nations Program	-	-	-	-	-
Total CDM	**1,759,036**	**3,519,823**	**2,800,238**		**8,079,097**

Table 45 Bluewater CDM

Total CDM savings by program are then allocated to Bluewater's rate classes in proportion to historic allocations for those programs. The percentages below reflect the typical share by class used in the LRAMVA workform. The sum of allocations do not necessarily equal 100% because shares for Residential and GS < 50 kW reflect kWh savings and shares for GS > 50 kW and Large Use customers reflect kW savings. The kW share is used for demand-billed classes to better represent the impact of CDM activities on the class's billing determinants.

Program	Residential	GS < 50 kW	GS > 50 kW	Intermediate	Large Use
	Allocation %				
Retrofit		14.5%	78.5%	6.5%	0.5%
Small Business		90.0%	10.0%		
Energy Performance Program		0.0%	25.0%	25.0%	50.0%
Energy Management		0.0%	25.0%	25.0%	50.0%
Customer Solutions		14.5%	78.5%	6.5%	0.5%
Local Initiatives					
Energy Affordability Program	100%				
	CDM By Class				
Retrofit	-	678,880	3,675,314	304,325	23,410
Small Business	-	376,739	41,860	-	-
Energy Performance Program	-	-	84,940	84,940	169,880
Energy Management	-	-	212,303	212,303	424,606
Customer Solutions	-	177,300	959,867	79,479	6,114
Local Initiatives	-	-	-	-	-
Energy Affordability Program	566,837	-	-	-	-
2021-2024 Savings	**566,837**	**1,232,919**	**4,974,284**	**681,048**	**624,009**

Table 46 2021-2024 CDM Framework Adjustments